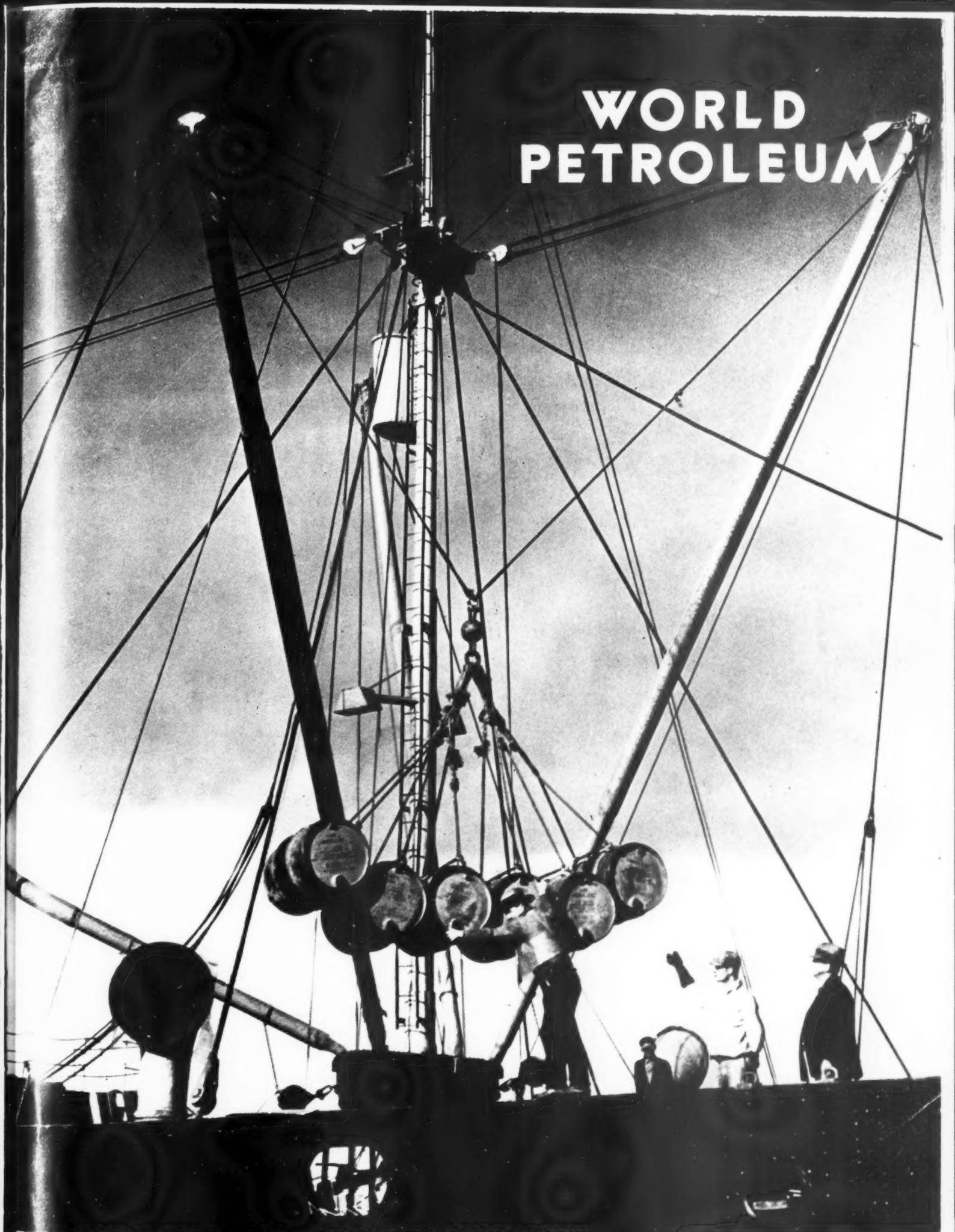
WORLD PETROLEUM



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Rex W. Wadman
General Manager

E. W. Mayo
Editor

J. C. Chatfield
Managing Editor

Sofie Cihowski
Assistant Editor

H. Arnold Jacobsen
Art Director

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EDITORIAL

INTERNATIONAL OIL TRADE'S FINANCIAL PROBLEMS

IN attempting to forecast the course of international trade, including trade in petroleum products, during the period immediately following the war, one question that continually crops up is the problem of financing. A number of the countries in direst need of liquid fuels to power the industrial machinery essential to their recovery from the effects of the war are without the means of paying for such supplies. This applies to practically all the countries of Western Europe which together constituted the world's largest single consuming market in the years before the Axis holocaust.

Financial considerations aside, the likeliest source of supply for the oil products needed by these nations would be the United States. This country has greatly increased its refining capacity in order to meet the tremendous demands of a two-hemisphere war. Outside its borders there is a shortage of refining facilities due to the widespread destruction of such installations both in the European and the Pacific areas. The logical result of this condition would be that America would provide the needed products utilizing both domestic and imported crude. Practically without exception, however, the would-be purchasers are without dollar exchange nor do they have immediately available other products to offer in payment. Not only that but unsettled conditions in many of these countries render the future value of their currencies uncertain and make acceptance of payment in that form impractical.

One of the leading authorities on international oil affairs, a man whose business connections make him thoroughly familiar with conditions in all parts of the world, recently told the writer of these lines without qualification that the only hope of providing the means of early recovery in the countries devastated by the war was through the extension of credits to governments or private interests by the government or commercial interests of the United States. To this he added the opinion that such loans would be reasonably safe and certain of repayment if made to western European countries though in some of the eastern countries the political outlook is still so obscure as to make an expression of opinion impracticable.

While the dollar has attained world wide recognition a great share of the world's trade and a substantial part of the world's production and consumption of oil lies within the area known as the sterling bloc where transactions are based upon the British pound sterling. This gives special importance to the relationship between the pound and the dollar. During the war this relationship has been maintained on a stable basis by official arrangements between the governments of the two countries.

Official management of exchange transactions has worked very well in wartime while most of the petroleum products coming from the United States have been used for military purposes or have been supplied on lend lease so that dollar settlements were confined to relatively small amounts. With the return to peacetime operation the handling of this matter will be less simple and the methods adopted for the control of sterling (some degree of control, undoubtedly, will be necessary) may have an important bearing upon the volume of business of American oil companies in the export field.

Members of the petroleum industry, therefore, have a very direct concern in the financial machinery set up to handle international commercial transactions. With the ratification of the Bretton Woods plan there are now, or presently will be, three agencies that will be in position to facilitate international exchanges. One of these is the inter governmentally directed institution provided by the Bretton Woods agreement with billions of dollars subscribed by the participating nations which will function primarily to maintain stability in exchange. Another is the Bank for International Settlements which presumably will continue in operation. A third is the Export-Import bank for which a great increase in capital recently was voted by Congress. Its special field is to assist the extension of American trade by loans on commercially sound security. In addition the various banking organizations which do an international business and have branches in all parts of the world will be able to resume the services which they have rendered in the past to traders and developers.

With these extensive facilities in operation it should be possible to get the machinery of international trade to functioning with reasonable promptitude and to enable products to begin moving through regular channels without too much delay. Much will depend, of course, upon the types of government established in countries where old political lines have been erased and new ones are in process of formation and upon the ability of these governments to enforce their authority and to preserve order. The hope is that the compelling needs of the people in all these disorganized states will operate to bring about an early return to the orderly conduct of their affairs.

WORLD'S OIL POSITION AS THE WAR ENDS

By Ruth Sheldon

Having Been Most Lavish in Use of its Petroleum Resources the United States is Less Favorably Situated than Other Leading Nations in Reserves for Long Range Future Development — Necessity for Expansion of American Interests Abroad Recognized but Action Toward International Agreement is Delayed by Incidence of Other World Moving Events.

THE atom bomb which shattered Hiroshima produced an equally devastating effect upon man's thinking. Economic concepts must be re-examined, revalued, readjusted. The fantastic knowledge that the use of atomic energy is no longer pleasant speculation but an overwhelming reality, makes it soberly imperative that each of man's problems be studied and solved in its entirety rather than in fragmentary, conflicting parts. If not, the very possibility of man's continued collective existence is imperiled.

Many an oil man before Monday, August 6, 1945, when discussing the possibility of an oil shortage in the United States was accustomed to point out that there was plenty of oil in sight, plenty yet to be discovered, plenty of oil shale and coal to be converted on that distant day when natural petroleum was exhausted. If anyone was still worrying their fears could be allayed, for by the time coal would be exhausted, in a thousand years or so, man would undoubtedly have figured out how to harness the sun's energy for his fuel purposes.

The stunning news that a thousand years from now is today has tumbled beliefs and theories into chaos. The day when a teaspoonful of substance unallied to petroleum will power a motor no bigger than your fist for an incredible distance is still in the future. But it is no longer just a possibility, it is a probability, if not a certainty, and no one at the moment would care to give odds on the time required to make it commercially practical.

The dismayed oil man who shuts his doors, cuts off his phone and begins to brood over the atomic future of the oil industry can first comfort himself with the fact that it already has laid a solid foundation for its future in the realm of plastics and chemistry and that it is unlikely that any natural resource, particularly one as adaptable and fundamental as petroleum, will go begging for a use. However, there is no way of sugar-coating the very bitter pill which the oil industry must now swallow: petroleum is no longer the indispensable fuel energy.

On the other hand, in terms of man's future well-being the solution of the petroleum industry's problems is more important than ever before. The world has been frightened and shocked, not by the economic possibilities and changes of this era, but by the realization that another war would end all wars by ending mankind itself.

The United Nations conference deliberately placed economic and social problems under the control of one body in framing the world charter, for these two factors are cause and effect of war or peace. With equally deliberate purpose the proposed Anglo-American oil treaty has been revised as an open-end agreement so that it could be co-ordinated into the machinery of the United Nations Economic and Social Council.

Regardless of the atom, petroleum is still the world's largest industry next to agriculture, still one of the most potent economic factors of war or peace. Now, because of the atom, the petroleum industry has an even greater responsibility to plan for peace.

Many oil men the world over have been inclined to emphasize only those petroleum facts which would prove a point favorable to their own viewpoint or policy. The vaporizing of a steel tower in New Mexico at 5:30 a.m. on July 16th marked the exact moment when such economic procedure would from then on become archaic and dangerous.

It is not enough to know how much oil a country has or controls today. It is necessary to know its oil position, past, present and projected into the future, in comparison with every other country. The areas of potential oil disputes must be found, studied and preventives prescribed. The oil structure and economy of the world must be harmonized as a whole. We must have a world oil policy as well as a national oil policy.

The giant structure of the world oil industry with its many intertwining and far reaching branches and allied industries rests upon the broad base of natural distribution of the earth's petroleum resources. The past, present and future control of these resources governs the oil policy of each nation no matter within whose borders they may lie.

In order to get our bearings in the world oil situation of today and as it may possibly be tomorrow, the accompanying table is a useful summary of the comparative positions of the various areas of the world in regard to oil resources. The factors taken into consideration are present proven reserves, division of ownership, total oil produced to date, and probable ultimate resources.

The figures concerning the world's probable ultimate resources are estimates of Wallace E. Pratt, retired vice-president and director of Standard Oil Company(New Jersey) and one of the world's outstanding economic geologists. Mr. Pratt has discussed the general allocation of the earth's probable ultimate petroleum resources in many distinguished papers and books. For the first time this chart publishes his breakdown by areas and percentages.

Mr. Pratt points out that the estimates are speculative and that their statistical character "is like the mortality tables which foretell accurately how many individuals will die during the coming year but are quite incapable of saying whether any specific individual in ordinary health will be one of those who die. So we can guess at total resources for the earth as a whole but we can't say just how much will come from Africa, for example, or from just what part of unexplored but potentially productive regions in Africa the largest recovery may be obtained."

"The basis in logic," Mr. Pratt further points out, "for the estimate of 600 billion barrels for the potential petroleum resources of the earth at large is our own experience here in the United States where we have already discovered some 50 billion barrels and have tangible evidence that at least as much more remains still undiscovered. If we have total resources of 100 billion barrels here at home, the earth as a whole with at least six times as great an area and volume of crust-stuff (rocks) carrying petroleum as are contained within the United States should have total resources of 600 billion barrels."

Mr. Pratt's estimates provide an excellent yardstick by which to compare the earth's various petroleum areas, for whereas the final figures may be revised upwards nevertheless the percentages will remain approximately the same. The average of our own oil finding history takes into considerationn most of the variables of oil structures and production.

The facts brought out by the accompanying chart are startling in many respects and lead to the following conclusions:

(1) The strength of a country's oil position cannot be judged by the amount of its present proven reserves. Major determining factors are the balance between its withdrawals and reserves, and its comparative position in the estimate of ultimate world resources.

(2) Russia is in the best oil position of any single country in the world as its rate of production has not prejudiced its position in regard to proven reserves and it has tremendous un-

developed potentialities, all within its own borders.

(3) The United States, taking only the resources within its borders, and in view of its high annual consumption rate (30 times per capita as much as the rest of the world) is in the worst oil position of any country, speaking in terms of its long range outlook for the future.

(4) The British oil position is very strong. This has been implemented by its foreign oil policy of using Western Hemisphere oil whenever possible in order to conserve its own reserves in Middle and Far East; also by keeping American interests out of Middle and Far East as much as possible. Because of the conditions under which this latest war has been fought British controlled resources have been drawn upon least heavily in fueling military operatins.

(5) At the present rate of withdrawal Western Hemisphere petroleum resources will be exhausted long before Eastern Hemisphere resources are even fully developed.

(6) More than one-half of the world's probable ultimate resources are owned by small powers in both hemispheres. At present 86 percent of the proven reserves in these same small power countries are under long term concession to American and British-Dutch interests.

(7) The potential area of conflict over control of petroleum resources lies primarily in the Middle East. Minor areas of conflict can be foreseen in the Gulf of Mexico-Caribbean basin, Southwest Pacific, Asia and Africa.

Combined with certain other economic and political factors these conclusions assume significant proportions.

Although Russia's oil position is strongest, nevertheless she can be expected to evidence active interest in acquiring middle eastern reserves outside her own borders. This could be motivated by desire to obtain foreign exchange as well as to strengthen her sphere of oil influence to compare favorably with that of the United States and Great Britain whose combined spheres of influence would far exceed those of Russia alone.

The emergence of Russia as a major world power may also strengthen the strong nationalistic trend of the last decade in the small power countries which own the great resources upon which American and British-Dutch interests are dependent for future expansion. Outright expropriation may not be followed but there is an increasing movement toward higher royalties and other economic restrictions.

The small powers also view the American-British-Dutch control of world oil as a monopoly within a monopoly for 74 percent of the world's present proven reserves (including the United States, but excluding Russia and Mexico) are held by seven companies, of which Britain's government controlled Anglo-Iranian accounts for more than 20 percent. Other international companies with worldwide holdings and activities are Standard Oil (New Jersey), Gulf, Texas, Standard of California, Royal Dutch Shell and Socony-Vacuum.

For the United States to assure itself of adequate oil supply without further prejudice to its own reserves it is necessary for its oil companies to expand their holdings abroad. In all the rich and still undeveloped areas it will find itself in competition, under present conditions, with the British-Dutch interests which have the same policy. Each of these areas, with the exception of the Gulf of Mexico-Caribbean basin, is under the present political sphere of influence of the British or Dutch.

Of primary importance to the United States is the Middle East, for as E. E. DeGolyer, leading independent economic geologist, has pointed out in his survey of Middle Eastern reserves, "the center of gravity of world oil production is shifting from the Gulf-Caribbean area to the Middle East — to the Persian Gulf — and is likely to continue to shift until it is firmly established in that area." Although American holdings in this area are not a great deal less than those of British-Dutch interests, restrictive agreements limit the efforts of three of the largest American companies.

It has been estimated that following the expected slump in world consumption after V-J day, within a few years peacetime consumption will reach and surpass the highest war level.

(Continued on page 126)

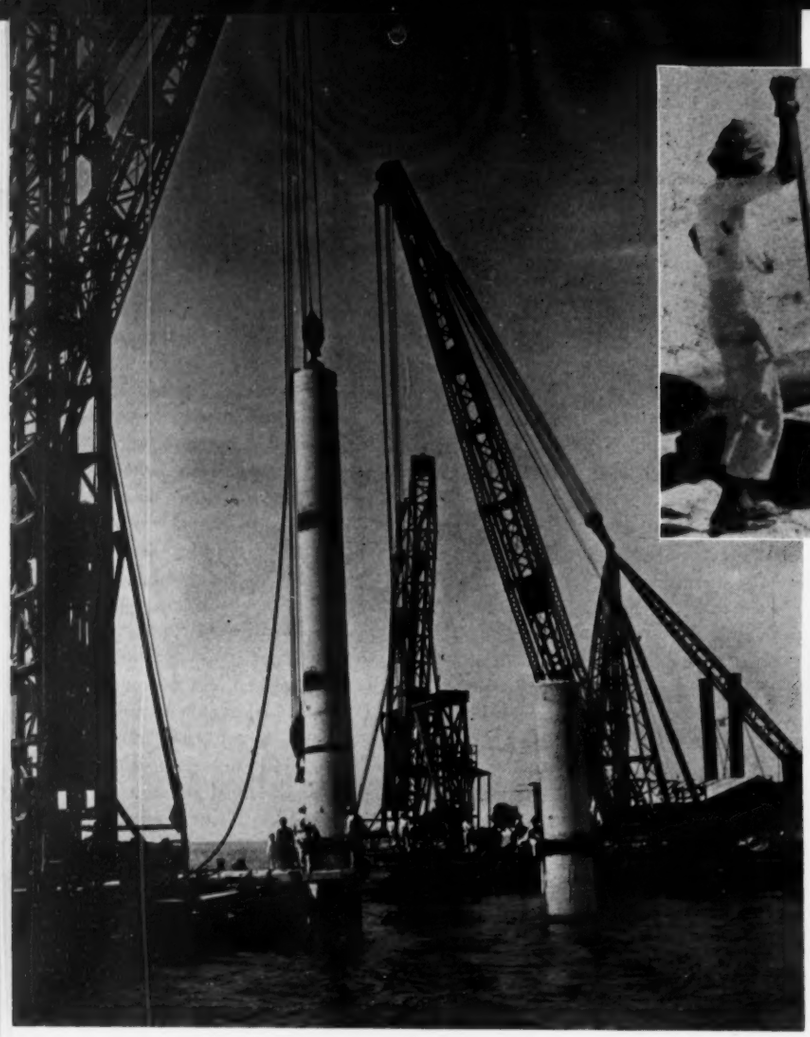
Area	Total Oil Produced to Date	% of World	Probable Ultimate Resources	% of World	Present Proven Reserves	% of World	% American Ownership	% British Dutch Ownership	% Other Nationalities Ownership
United States	29,776,843,000 bbls	*63.90%*	100,000,000,000 bbls	16⅔%	20,453,000,000 bbls	32.07%	95.00%	5.00%	—
Gulf of Mexico-Caribbean Basin*	5,678,123,000 bbls	12.17%	80,000,000,000 bbls	13⅓%	8,521,000,000 bbls	13.36%	67.00%	23.80%	9.00%
Balance South America	683,123,000 bbls	1.47%	10,000,000,000 bbls	1⅔%	214,000,000 bbls	.33%	2.80%	12.60%	84.50%
Canada	105,074,000 bbls	.23%	10,000,000,000 bbls	1⅔%	150,000,000 bbls	.23%	50.00%	50.00%	—
Alaska	—	—	10,000,000,000 bbls	1⅔%	—	—	100.00%	—	—
Russia	5,370,539,000 bbls	11.52%	110,000,000,000 bbls	18⅓%	5,735,000,000 bbls	9.00%	—	—	—
Balance Europe	1,477,418,000 bbls	3.18%	10,000,000,000 bbls	1⅔%	630,000,000 bbls	1.00%	26.00%	27.00%	46.20%
Middle East	1,730,581,000 bbls	*3.71%*	180,000,000,000 bbls	30%	26,800,000,000 bbls	42.00%	41.50%	52.40%	6.00%
Africa	78,561,000 bbls	.17%	10,000,000,000 bbls	1⅔%	86,000,000 bbls	.13%	—	100.00%	—
Southwest Pacific**	1,220,839,000 bbls	2.63%	60,000,000,000 bbls	10%	951,000,000, bbls	1.50%	29.00%	71.00%	—
Balance Asia	466,530,000 bbls	1.02%	20,000,000,000 bbls	3⅓%	233,000,000 bbls	.36%	—	71.70%	28.30%
WORLD	46,601,876,000 bbls	100.00%	600,000,000,000 bbls	100%	63,773,000,000 bbls	100.00%	57.70%	28.70%	13.60% (Russia—9%)
Eastern Hemisphere	10,344,568,000 bbls	*22.23%*	390,000,000,000 bbls	65%	34,435,000,000 bbls	54.00%	33.50%	44.00%	22.40% (Russia—16.6%)
Western Hemisphere	36,244,428,000 bbls	*77.77%*	210,000,000,000 bbls	35%	29,338,000,000 bbls	46.00%	86.00%	10.70%	3.20%

**Gulf of Mexico-Caribbean Basin includes the upper Amazon Basin, Mexico, Central America, Colombia, Venezuela, Eastern Peru, Eastern Ecuador, Western Brazil.*

***Southwest Pacific includes Sumatra, Borneo, New Guinea.*

NOTE: British and Dutch ownerships are listed together due to the intertwining and predominance of the Royal-Dutch-Shell combine interests. Under the listing of ownership by "Other Nationalities", Government monopolies or near monopolies account for the majority. Mexico represents the major share of "Other Nationalities" in the Gulf of Mexico-Caribbean Basin, as does Argentina in "Balance South America." In Europe, Romania provides most of "Other Nationalities" with both French and Romanian capital as well as other nationalities represented to various degrees in many small companies. The Middle East "Other Nationalities" is largely the French share in Iraq.

Estimates of proven reserves are those presented by the Industry to the O'Mahoney Senate committee.



Two Pile Drivers are Used in Sinking Caisson at Drilling Location in Lake Maracaibo, Venezuela.

Top Right: Welding on the Damman-Ras Tanura Pipeline.

Rantan Field—North Sumatra

WORLD WIDE DEVELOPMENT ACTIVITY FORECASTS HEAVY EQUIPMENT DEMAND

WITH the termination of hostilities in Europe and the collapse of Japan's power of resistance, industry as a whole is turning its attention to the opportunities and responsibilities that attend the return to peace. So far as the oil industry is concerned the promise of the future is written in the insistent demand for more production that is heard from every quarter of the globe. Never before, it is safe to say, has the world been so highly oil conscious as it is today. Governments have a new realization of the value of petroleum to their national economy. International companies with broad markets to serve know that they must make constant additions to their reserves in order to insure a future supply. Nations that are highly developed industrially must rely upon petroleum to maintain their position; others more backward depend upon it to attain more rapid progress.

Moreover, the war itself has been responsible in two respects for raising the demand for oil industry equipment much above its ordinary peacetime level. Since oil is a vital requirement of modern military operations petroleum installations have been a preferred object of attack throughout the war. The destruction spread in the industry has been tremendous and will require much time and vast sums of money to repair. While its cost cannot be fully determined as yet it is conservatively estimated that it will be at least double the billion dollars expended on the war program of the United States. In the second place the war put a stop to exploration, new construction and replacements of obsolete equipment for the past five years and the accumulated demand of this whole period remains to be satisfied in addition to usual year to year extensions.

Taken together the demands arising from these causes will impose a task of herculean proportions upon the engineering firms and equipment manufacturers who serve the industry. Merely to take care of the normal replacement demands that have accumulated during the war years when it was impossible to obtain materials except for military purposes will be sufficient to engage all their facilities for the next several years. Restoration of resources that have been damaged or destroyed will impose an additional load of almost equal dimensions. For a decade at least the supply industries will be riding a high tide of activity that will call for a great expansion of their operating facilities, their capital investment and their skilled manpower.

A brief survey of activities now under way or projected for early attention may convey some impression of the task that lies close ahead. In almost every part of the Western Hemisphere from Pt. Barrow at the northern tip of Alaska to Tierra del Fuego near the Antartic Circle the search for oil is being put under way. Survey activity is at an all-time high and is limited only by the amount of physical equipment and the number of skilled crew men available. In the United States the industry is fully alive to the necessity for locating new fields. Exploration not only is being pushed in extending areas already productive but is being carried into other regions as for example the southeastern Gulf-Atlantic states, the Pacific northwest and the central plains region. Drill-

Top: Damaged Installations on Tarakan.

Palembang—One of the Refineries Destroyed in Sumatra.

ing operations for the current year are fulfilling the program laid out by the Petroleum Administration which calls for 27,000 wells and will be expanded whenever the encouragement of a more remunerative price for crude and a more abundant supply of materials is offered.

Mexico is setting forth on the reconstruction and expansion of its entire industry in order to meet the growing needs of its domestic market and to regain its former place as an exporter of products. Fifteen million dollars have been appropriated for the current year for the drilling of wells in established fields and for putting down a number of wildcats in areas recently surveyed. Modernization of the country's largest refinery at Atzcaputzalco and the addition of a 100-octane gasoline unit is now going forward and is expected to be completed early next year. This, however, is only the initial move in the reconstruction of the country's entire refining equipment and the building of two or possibly three new plants. The carrying out of this program will require a large amount of drilling both in developed and undeveloped areas, the laying of a number of pipe lines, the erection of a stabilization plant in the Poza Rica field and the provision of extensive bulk storage and distribution facilities. Execution of the complete plans that have been drawn necessarily will extend over several years but the works scheduled for early action will call for expenditure of $50,000,000 or more. In Central America and the West Indies the exploratory work interrupted by the war is being resumed with plans for the drilling of a number of wells in Nicaragua and Guatemala and surveys in other countries. Wildcatting is under way in several of the West Indian islands.

The busiest section anywhere outside the United States at the present moment undoubtedly is Venezuela where between forty and fifty drilling rigs are in operation with the expectation that half as many more will be put to work during the coming year. Important discoveries both in the east and west have stimulated activity in this direction and companies that have recently obtained concessions such as Richmond, Phillips and Barnsdall, are hastening development work on their holdings. The extensive plans for refinery construction in Venezuela which will call for the construction of four or more new plants at a cost of $150,000,000 or more were fully described in a recent issue of this magazine* but still greater expenditures will be required by the expansion of production, the building of roads, towns, pipe lines and terminals now getting under way.

Colombia likewise is experiencing a great renewal of activity with exploratory drilling going forward in a number of new areas, extensions of existing fields being pushed and the establishment of refineries under consideration.

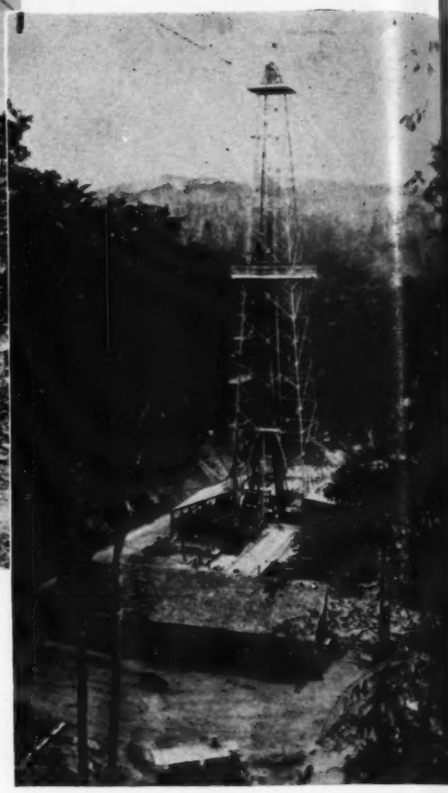
Argentina is another South American country which feels an urgent need to increase production in order to put itself in a position to reduce its dependence upon imports and to fill its domestic needs as nearly as possible from its own fields. To realize this ambition it is in the market for a large amount of drilling machinery and pipe line material and plans the erection of new refineries at points in the interior to simplify the distribution of products to areas now inadequately supplied. Plans which Bolivia has had drawn up for the past two years for the development of production, the enlargement and modernization of its refineries and the installation of transportation facilities are now being put into motion and will call for the expenditure of several million dollars. Outlets for its oil both to the Atlantic and Pacific coasts are being provided by the building of railway and pipe lines.

In other parts of South America oil development is going forward. Brazil is extending its drilling campaign and exploratory drilling is going on in the large concession held by Shell in eastern Ecuador. Chile is pursuing its search for oil in its southern districts which are believed to hold the best promise of production. A survey of the great Chaco district of Paraguay is being actively pushed by the Union Oil Company under the contract recently made with the Paraguayan government. From north to south and on both slopes of the Andes hundreds of millions of dollars of capital will be expended on oil development in the next few years, calling for great quantities of equipment and making that continent a more important factor in the international oil industry than it ever has been before.

Halfway round the world another great upswing in oil development centers in the Middle East. At the close of World War I, the only country producing in that great area between the eastern Mediterranean and the borders of

**World Petroleum — Annual Refinery Review, July, 1945.*

Yenangyaung Field in Burma After Recapture by the British.



Right: Test Well at Sampang, New Guinea.

Below: Jap Oil Storage Tank Hit by Flyers in the Early Strikes at Saigon.

India was Iran (Persia) with a daily output of some 33,000 barrels. Today Iran's production has grown to 300,000 barrels. In the nineteen twenties the Iraq Petroleum Company, joint venture of a group of international companies, began the exploitation of a concession in that newly established kingdom. By 1935 the prolific Kirkuk field had been proved, a double pipe line had been laid across the desert to the Mediterranean ports of Haifa and Tripoli and 80,000 barrels per day were being delivered to these terminals. In rapid succession new production was found at Bahrein on the western side of the Persian Gulf, at Kuwait further to the north and, most important of all, on the main portion of the Arabian pennisula, in Saudi Arabia. Other fields were located in Qatar and in Iraq west of the Kirkuk development. By 1938 the output of Iran, Iraq, Bahrein and Saudi Arabia, the only areas in active production, had risen to 330,000 barrels daily but this was only a step toward realization of the full potentialities of this great region which is now generally looked upon as holding possibly the greatest undeveloped reserves of any comparable area on earth. Since the beginning of the present war the refining capacity of the Middle East has been raised to more than half a million barrels daily including the 50,000-bbl. Ras Tanura plant of Arabian-American Oil Company now near completion.

In this southwestern corner of Asia some of the most important undertakings of the early post-war period are scheduled for action. One of these which has been in the blueprint stage for a long time but has been delayed by the war is the enlargement of the Iraq pipe line. This is to take the form of a 16-inch line paralleling the main artery of the present system and the southern fork of the bifurcated section of the line. It will double the capacity of the line and call for a further enlargement of the Haifa refinery if all of the crude moving through the new line is to be processed there.

Apparently authentic reports state that the French government is considering the construction of a refinery at Tripoli, northern terminus of the Iraq pipe line, to process a part at least of its share of the crude produced from the Kirkuk field. Newspaper reports have stated that the two American companies interested in Iraq — Standard Oil Company (N. J.) and Socony-Vacuum — have entered into contracts to erect refineries at Tripoli. These reports, however, are branded as incorrect by spokesmen for the two companies who explain that the application for permits to erect refineries is merely a move to protect their legal interests in case of possible developments that might make plant construction at this point desirable in the future and does not mean that their erection is more than a possibility.

Another pipe line that has been the subject of much speculation and some acrimonious discussion is a line to connect the fields on the Gulf side of Saudi Arabia with a port on the eastern shore of the Mediterranean. When it was originally projected for construction by Petroleum Reserves Corporation, under the ownership of the United States Government, so much opposition was raised to the entry of the government into the oil industry in a foreign field that that particular plan was allowed to drop. The enterprise itself still is very much alive, however, and will be carried through as a private undertaking by the Arabian-American Company backed by its co-owners, The Texas Company and Standard Oil of California, as soon as the energetic drilling campaign now under way brings production up to a volume sufficient to keep it in operation. Surveys have been made of several tentative routes which the line might follow and the Trans Arabian Pipe Line Co. has been organized. With a proposed capacity of 200,000 barrels daily the line with necessary terminals and accessory facilities probably would cost $100,000,000 or more but it would give Persian Gulf oil a westward outlet that would put it in a position to compete for

markets on both sides of the Atlantic as well as in the Orient and Oceanica.

Kuwait Oil Company, Ltd., joint venture of Gulf Oil Corporation and Anglo-Iranian Oil Company, Ltd., has developed a field of first-rate importance with proved reserves estimated at four to five billion barrels and this oil likewise must find an outlet either by an independent pipe line, by connection either with the Iraq or Arabian systems or by tanker service. Other companies representing the same interests that comprise Iraq Petroleum hold concessions in western Iraq and at several points on the Arabian peninsula such as Qatar where production already has been established. Development of these concessions undoubtedly will add in greater or less degree to the sum total of Middle East production.

Finally in Iran itself there are large undeveloped areas which international interests consider sufficiently promising to justify intensive exploration. Political rivalries here as in the past may delay progress but if these can be adjusted active development will follow quickly.

Taking into account only those projects which already are under way or are marked for early action investments of upward of a billion dollars will be made in the Middle East within the next few years in drilling, pipe line and refinery construction and related operations which will make this great area a principal center of production and possibly the world's leading exporter of oil products.

In the Far East the capitulation of Japan points to an early start toward the restoration of fields and refineries that have suffered heavily during the war and to a resumption of the exploratory work that was actively under way at many points in this part of the world before they were interrupted by the outbreak of hostilities. As in the case of Borneo invading Allied forces will be accompanied or closely followed by experienced oil industry workers whose task will be to restore as much production as can be brought into operation by temporary repairs. Later on, when the full extent of the damage inflicted can be measured, the work of reconstruction on a permanent basis will be undertaken. In eastern Borneo the heavy attack by Allied forces made necessary in order to overcome the stubborn resistance of the Japanese resulted in more sweeping destruction than had been incurred in the earlier invasion, but the enemy's surrender should have avoided the infliction of additional destruction in other oil bearing islands such as Java and Sumatra, the latter being the most important producing area in the Far East and the location of its largest refineries. Some of the latter, notably the great Palembaug plant of Standard Vacuum, are known to have been effectively demolished at the time of the Japanese occupation but others may be in condition to resume at least partial operation after a certain amount of repair. Burma's refineries were effectively wiped out on the approach of the Japanese army and it seems a safe assumption that the refining facilities of the Far East will have to be largely rebuilt.

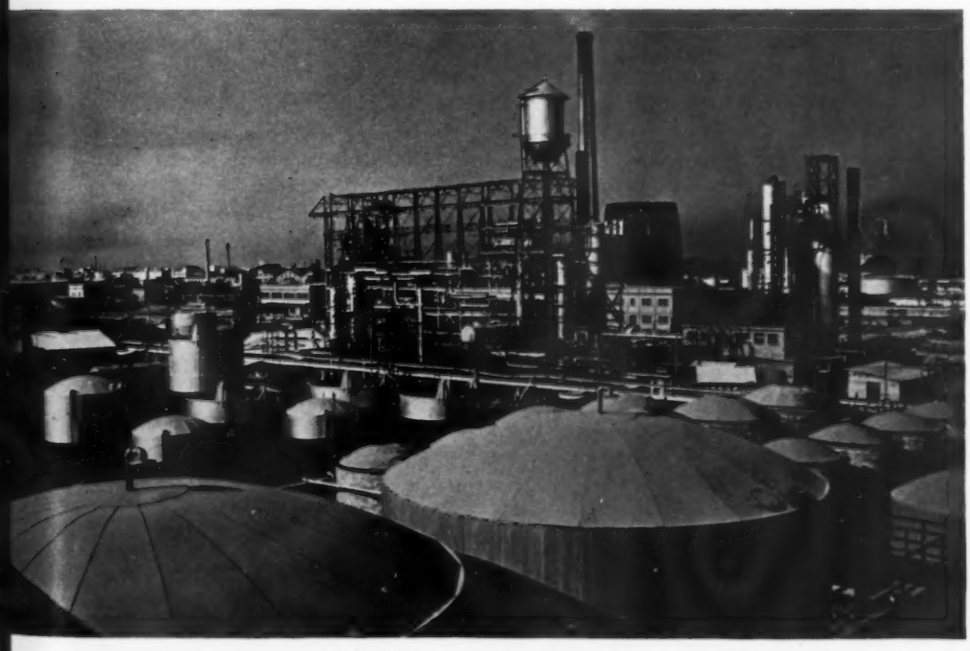
Prior to the start of the Pacific conflict exploratory drilling was under way in the East Indies, largely in Sumatra and New Guinea, both in the Dutch and British controlled portions of the latter island. This work is scheduled for resumption as soon as men and materials can be moved in. Every kind of oil industry machinery and supplies will be needed in the Far East where expenditures on this score running to hundreds of millions of dollars, perhaps more than a billion, will be needed to put the industry back on the road to expansion along which it was traveling before the blight of Japanese agression descended upon it.

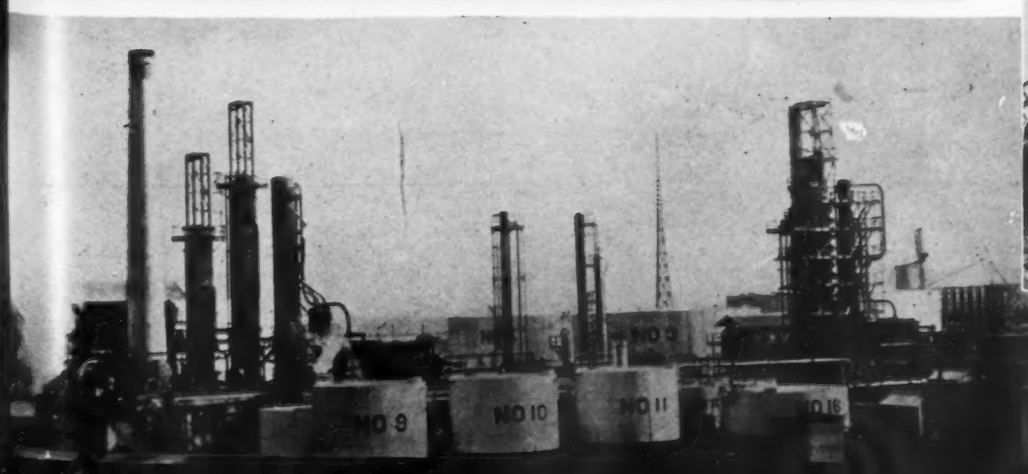
The story of the destruction visited upon the European oil industry has been told in the war news of the past three years. Surveys made

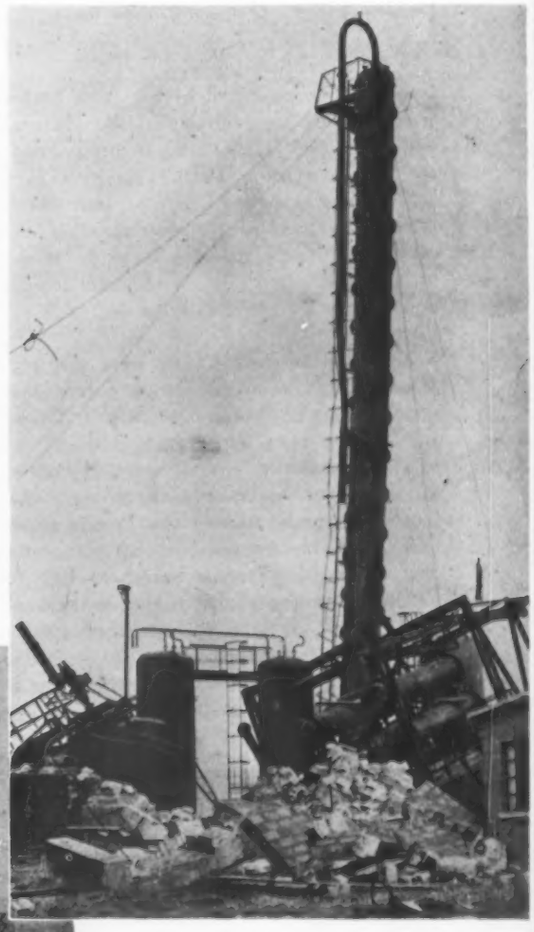
...w of Refinery at Naples, Later Damaged by Bombing.

Bottom: Japanese Refinery at Kawasa Before the American Bombers Visited It.

Rubble Around Distillation Tower—Ploesti Oil Fields.







since the German surrender reveal that in areas where bombing was persistent the damage inflicted was more extensive even than aerial photographs made during the progress of the fighting had indicated. In Germany itself over ninety percent of the capacity of synthetic plants was erased and in the final stage of the war the German armies were virtually without gasoline or the means of supplying it. In view of the pattern laid down for Germany's future by the victorious powers there will be no revival of synthetic oil production but refineries capable of meeting minimum industrial needs will be reestablished and these probably can be supplied from the country's own crude production.

Outside of Germany the situation varies in different countries according to the degree to which they received the actual impact of the war. In Romania, the one European nation with substantial exports, the spectacular attack by American planes upon Ploesti dealt the first crippling blow to Germany's oil economy and subsequent assaults reduced the country's refinery output to about twenty percent of its normal volume. Since the Russian occupation repairs to a number of plants have enabled them to get back into operation. No information as to current output has been released but it is known that a considerable volume of Romanian oil is going to Russia which is stated to be taking seventy percent of the production. To put the Romanian industry on an efficient basis, however, a general rehabilitation of refineries will be needed and additional drilling necessary to offset the fall in production from existing wells.

Italy's refineries suffered heavily from bombing attacks during the protracted Italian campaign with demolition ranging from twenty percent to one hundred percent. The uncertainty as to the political and economic future of Italy has delayed action toward the restoration of these plants but if the industry is to be restored to its former proportions an elaborate construction program will have to be carried out.

Refineries in northern France were very badly damaged, first by demolition work carried out under government orders before the German advance and later by bombing attacks. Those in southern districts escaped serious injury and are now in operation so far as the very scarce supplies of crude permit. The French government is moving to reestablish the plant of its own Compagnie Francaise near Le Havre. Oil companies owning plants in the northern districts propose to introduce equipment sufficient to restore partial operation but appear inclined to await further information regarding the extent to which the government intends to carry its policy of industrial nationalization before attempting complete reconstruction. This is a feasible policy since they will be able to bring in products in such volume as the revival of commercial life may make necessary from refineries which they operate elsewhere.

In other European countries little direct damage was caused to oil properties by war activities but the war has prevented the making of normal replacements or the introduction of improved processes and the problem of obsolesence will have to be dealt with.

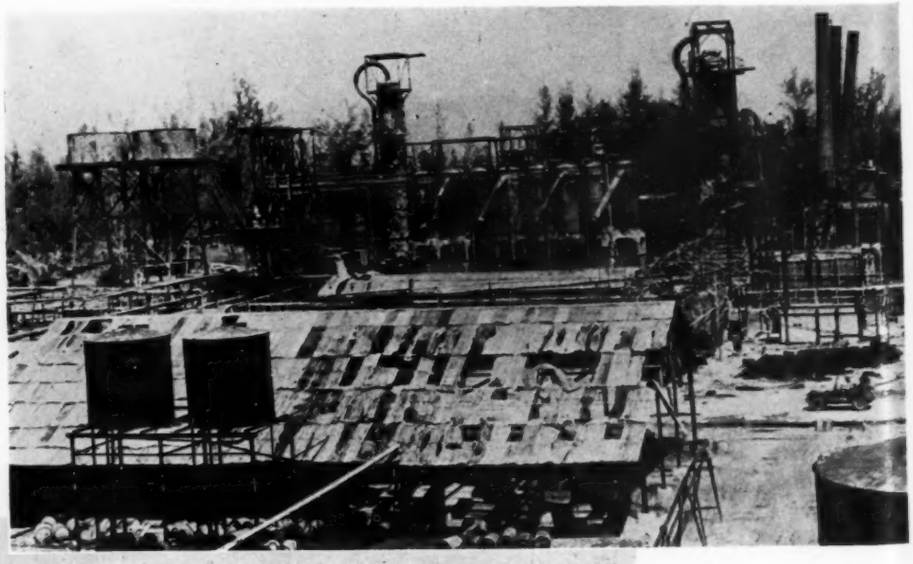
In any review of oil industry expansion in the period following the war one country that cannot be overlooked is Russia. While the Soviet Union suffered a Nazi invasion that penetrated a thousand miles from the western border, destroyed several refineries and overran one important oil field this was but a minor and temporary setback. As a whole the Russian industry made important progress during the war years. New fields of high potentiality were discovered in the central states, greatly extending the productive area originally designated as the "second Baku". Other important discoveries were made further north, along the shores of the Caspian and in Central Asia. Pipe lines were laid to transport oil and gas to industrial cities, new refineries were built and production was substantially increased. In the elaborate program that has been mapped out for the development of a new and industrially powerful nation, petroleum has been assigned a leading part and a large proportion of the credits which Russia is seeking to establish in the United States is to be applied to the purchase of oil industry equipment. Recently an order was placed with one American firm for one hundred light rigs to be used in exploratory drilling and negotiations are under way for large quantities of equipment in addition to the four complete plants previously purchased.

In considering the outlook for international oil development in the period that lies ahead of the final attainment of peace account must be taken of a number of factors that will combine to bring about a tremendous acceleration of activity in widely separated parts of the world. Costly as this war has been to the nations actively participating it has brought important financial gains to many others that have supplied the materials required by war. At the same time it has created in all these lands a desire for better living conditions, for good roads and modern means of transportation and all the aids to industrial development that oil can bring.

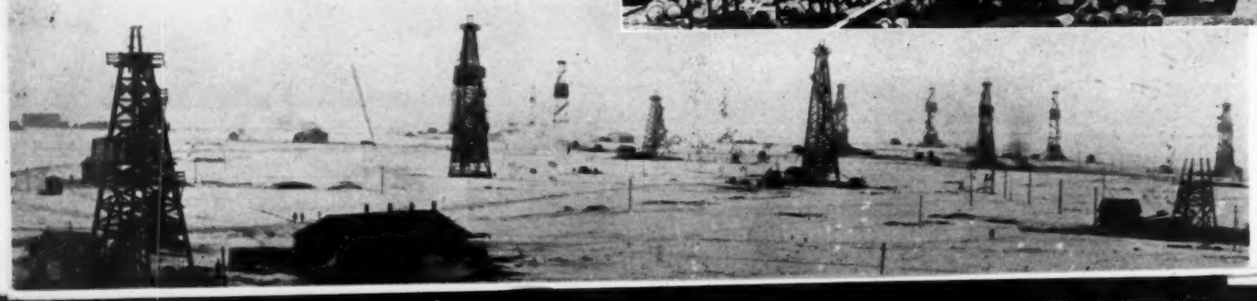
Restoration of the fields, refineries and distributing facilities partially or wholly destroyed by war is in itself a tremendous task the completion of which will cost thousands of millions of dollars. Satisfaction of the pent-up demands for machinery and equipment which has been impossible to obtain for five years past calls for an outlay equally great. Above and beyond these, however, is a world consciousness of the value of oil and of all the advantages it brings that will stimulate consumption in areas where little use has been made of it in the past and will assure a sustained growth for the industry reaching far into the future.

For those who can supply the technical knowledge, the scientific methods and the improved equipment needed for the discovery, production and processing of oil this new era of world development is of special significance. It gives a new importance to the export market and calls for its cultivation through more intensive study and more effective use of modern methods of sales promotion.

View of Damaged Oil Refinery at Lutong, Borneo.



Section of the Syzran Oil Fields—in Russia's New Baku.



PETROLEUM IN PEACE AND WAR

By Joseph C. O'Mahoney

U. S. Senator from Wyoming

WE stand upon the threshold of a great adventure—the transformation of a war economy, in which commodities were produced primarily for destruction, into a peace economy in which they will be produced primarily for use by the people. I call it a great adventure because, heretofore, men and even industries have worked in a rather haphazard manner without the cooperation and coordination which in this war has enabled us to outstrip the whole world in war production. We found it necessary not only to have all the United Nations work together in harmony, but all industries as well and, within each industry, all groups and individuals. Now we know what intelligent coordination can do.

In no industry was this better illustrated than in the oil industry. There was a job to be done. Petroleum had to be supplied for tanks and trucks; for airplanes; for submarines and battleships—and most of it had to be supplied by the petroleum industry of the United States. This country has actually furnished almost 75 percent of the seven billion barrels or more of petroleum produced by all the United Nations since Pearl Harbor.

When we entered the conflict, the Axis powers had so sealed off the petroleum sources of the world that only from us and through our facilities could the supplies necessary to carry on the war be obtained. That meant that it was necessary for us not only to furnish transportation to every fighting front, but also to increase production of crude oil in the United States by over a million barrels every day.

The daily production of crude petroleum in this country in 1941 averaged approximately 3,800,000 barrels. By June of this year that average had increased to 4,800,000 barrels. Recently the Petroleum Administration for War called upon the oil industry to push the production rate up to an all-time high of over 5,200,000 barrels daily.

With peace at hand and the war demand off; when the government is no longer buying millions of barrels of petroleum to supply the armed forces of ourselves and our allies, we shall have to make up our minds to find another huge market for our production or witness a serious curtailment of activity in this industry. Oil men know what a surplus of oil means. That's why I call it a great adventure that awaits us—the great adventure of calling into existence peacetime activities of such magnitude that they will continue to demand the full productive activity of which we know we are capable. This does not mean that we shall be prepared to produce oil at a rate that endangers our reserves. It means only that we shall have to concentrate on creating and maintaining civilian markets so that in the petroleum industry, and in every other industry, a high rate of business activity may be maintained.

How great that task will be may be illustrated by the problem that will confront the branch of the petroleum industry that produces 100 octane gasoline. The giant high octane refineries, constructed for this war, are now producing at a rate of 21 million gallons every day. This product effectively cut Japan off from the mainland of Asia. General Chennault's 14th Air Force was able to sink one ton of Japanese shipping for every 2.2 gallons of aviation gasoline used by his airplanes.

But what are we going to do with this daily output of 21 million gallons of high octane aviation gasoline now that the war is over? What are we going to do with the 1,000,000 extra barrels of crude oil?

That is the problem to which every branch of the petroleum industry must give heed in the days that are to come. That is the reason why the United States Senate has appointed the Special Petroleum Committee, of which I happen to be Chairman, to conduct a study of the whole petroleum problem. That is why Senator Hatch, of New Mexico, and I on July 6, 1945, troduced a bill to amend the Federal Oil Leasing Act.

That bill, by the way, was not regarded by either of us as finished product. It was introduced in order that the oil industry might have something specific before it to consider in preparation for further hearings by the committee. Its general purpose is to facilitate and, so far as possible, to stimulate operations upon the public domain by improving relations between the Department of the Interior and the oil and gas lessee.

This principle may be laid down. It is the role of government to protect the public interest, to be sure, but the government should not act as though it were a private proprietor trying to drive a hard bargain with every lessee. Its policy should be to promote development and, therefore, it should cooperate with the explorer and the producer rather than try to impede his operations.

We must recognize the great value of the pioneer—the wildcatter. We must recognize the great contribution made by those who work out plans for the development of new fields. We must recognize the responsibility of government to aid the oil industry. We must also recognize the necessity for coordination and cooperation among all elements in the industry, little and big, to advance the public interest as well as their own.

Beyond this, however, I think it ought to be said that we must keep in mind the primary necessity of building up the West. The area west of the Missouri River holds out, in my opinion, the greatest opportunity that yet remains for the creation of the purchasing power that will make the markets American business will need.

Every industry has a stake in building up the West. When we build new communities on the great reclamation projects, we shall be creating consuming power for all commodities. When we develop the natural resources of the West; when we develop the scenic wonders of the West; when we build new airports and new roads; and when we make it possible for returning veterans to settle upon our lands; and when we create new local business, we shall be increasing purchasing power to buy the products of the petroleum industry and all other industries when government purchases for war have ceased.

It was cooperation and coordination of nations, industries and men that won the European war and has now won the Japanese war. Similar cooperation among American industries and citizens will enable this nation to establish new and higher standards of living when peace is achieved. And when we have higher standards of living, we shall have better business. In this great new adventure of winning the peace, I know that those who are engaged in the production and distribution of petroleum will play the same fine part they have played in carrying on the war.

What is true for the United States is also true for the world at large. A glance at some of the charts which have been presented to the Senate Petroleum Committee at its various hearings shows beyond all argument that commerce goes where purchasing power exists. The high rate of business activity in the United States and in Europe has been a reflection of the purchasing power of the inhabitants of these areas. Asia and Africa do not attract the flow of commerce that comes to us and goes to Europe, because the standard of living in these continents is so far below that which we have attained that the people there do not demand all the goods and services which are in common use in Europe and the United States.

As the petroleum industry moves into the post-

(*Continued on page* 130)

PETROLEUM TRADE IN EARLY POST WAR PERIOD

End of Pacific War Permits Restoration of Full Civilian Supply but Decrease in Demand of Million Barrels May Follow Termination of Heavy Requirements— Export of Petroleum Products Expected to Return to Pre-war Level but with Crude Shipments Declining.

HOPE for a substantial increase in the amount of petroleum products for civilian use in the United States was a prompt result of the conclusion of the Pacific war. The sudden collapse of Japanese resistance under the twin blows of devastating attacks by atomic bombs and Russia's entry into the conflict are credited with the quick acknowledgment of utter defeat from the enemy. They undoubtedly hastened a decision which had become inevitable as a result of the long and gruelling campaigns waged by the Army and Navy of the United States and their combined air forces which had placed an effective blockade around the Island Empire, shut off its supplies of oil and other essentials and destroyed many of its industrial plants. The costly campaigns from Guadalcanal to Okinawa had made certain the defeat to which the world's most devastating bomb and the appearance of Russia as an adversary applied merely the finishing touches.

Oil contributed in double measure to Japan's elimination as an adversary, even without the contemplated large scale invasion of the home islands. In the first place, the tremendous volume of petroleum products poured out by American wells and refineries made possible a steady increase of attacking power until it rose to irresistible proportions. In the second place, the severance of Japan's sea communications, the destruction of refineries and storage plants and the shutting off of outside supplies of fuel that could not be replaced from any other source brought about a fatal weakening of its ability to attack or to defend.

In the opinion of military authorities who directed operations in the Pacific theatre the waning air and naval strength of Japan was due in large part to a growing scarcity of gasoline and fuel oil. The mounting air offensive against Japanese refineries, oil transport and storage installations steadily accentuated this shortage and reduced Japan to the same condition that paralyzed Nazi forces in the final weeks of the European war, leaving them with few planes and without fuel to keep even those few in the air.

While the final outcome of the war in the Pacific had long ceased to be a matter of doubt, the actual cessation of hostilities came as a surprise which was evidenced in the breathless interest with which the public awaited final confirmation of Japan's surrender. It was no less a surprise to Allied military authorities who had based their preparations upon the assumption that the war probably would continue to the end of 1946 although many of them felt that the end might come six months earlier.

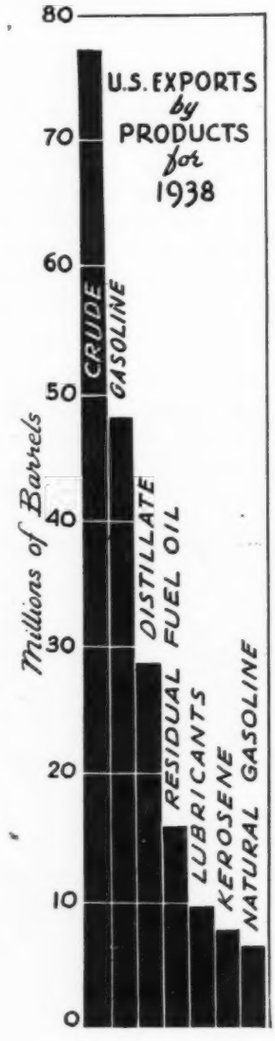
In the estimate of total petroleum demand and supply for the United States for the twelve months beginning July 1, 1945 which was prepared by the Economics Committee of the Petroleum Industry War Council only two months ago daily requirements and available supplies from production were put down as follows in thousands of barrels:

	1945 3rd Quarter	1945 4th Quarter	1946 1st Quarter	1946 2nd Quarter
Demand	5,378	5,589	5,721	5,555
Supply				
Crude Production	4,854	4,840	4,783	4,730
Nat'l. Gas. etc.	344	358	363	367
Imports	189	189	231	269
Total Supply	5,387	5,387	5,377	5,366

This estimate was based on the assumption that the Pacific war would continue throughout this period, that the allocations for civilian use would remain as they then were and that restrictions then in effect would remain unchanged. On this basis a deficit averaging 267,000 barrels daily was indicated for the first half of 1946 which, if realized, would have called for a further reduction of already depleted crude stocks.

For the United Nations as a whole the estimated shortage in supply averaged 107,000 barrels daily for the twelve month period but it was stated that steps were being taken to overcome this small deficit of only two percent by increased production in the Caribbean and Persian Gulf areas.

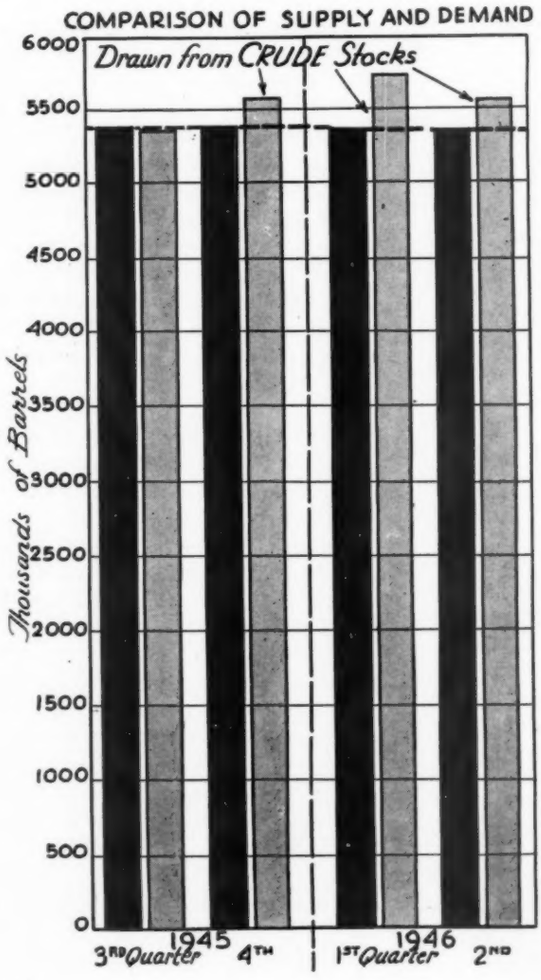
The abrupt end of enemy resistance has made necessary a complete reappraisal of conditions affecting oil production as of many other industries. It will still be necessary to maintain a large fleet and a relatively large air force in the western ocean as well as an occupying army in Japan but a prompt decline was at once registered in needs for aviation fuel and gasoline of commercial grade. Statisticians of the oil industry have made many studies of probable requirements once peace was restored and the restrictions upon the free use of petroleum products were lifted. Their conclusions vary somewhat but the majority view appears to be that in the first year following the termination of the war demand in the United States will average about 4,150,000 barrels daily and that with allowance for natural gasoline and for the imports normally required to maintain a balanced output of products it will call for a domestic crude production of 3,800,000 barrels daily or slightly over that figure. In other words the general expectation is a return to practically the same level of demand that prevailed in 1941. If these calculations are reasonably accurate they indicate a decrease of roundly a million barrels a day from the current output of American wells if supply and demand are to be kept in approximate balance. A part of this decline will come about naturally and quickly owing to the fact that certain fields were being forced to produce above their maximum efficient rate. This form of over-production which is in direct contravention of sound conservation has been calculated by the statisticians of the Office of Petroleum Ad-

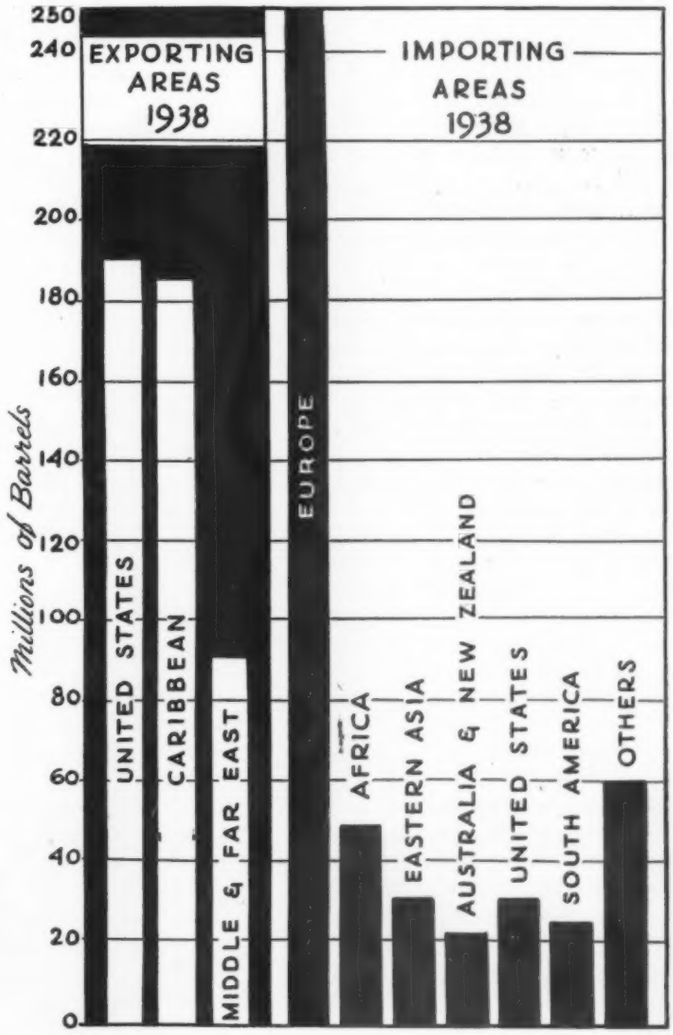


ministration as about 200,000 barrels daily. a number of the larger oil companies undoubtedly will welcome the opportunity to reduce the toll on their production facilities, particularly in the higher cost fields. There probably will remain, however, a large number of producers who will be reluctant to cut down the rate of production which has been established under the pressure of wartime demand. If this proves to be the case it will present an opportunity and a responsibility for state regulatory bodies to effect a readjustment in accordance with physical and economic conditions.

Estimates of probable post war requirements obviously must take into account as a main factor the time when automobile manufacturers, released from the war contracts which have preempted their facilities for the past four years, can resume full production for peacetime use. Regardless of developments that have taken place during the war and changes in the demands for fuel that may ultimately result, the millions of private and commercial cars running on American highways will continue to provide the all-important market for the oil industry. Production of 300,000 motor cars which is the number anticipated during 1945 obviously will not go far toward replacing the 8,000,000 more or less that have gone out of operation since 1941. In the first twelve months after the war is ended it is calculated that from 2,000,000 to 3,000,000 new cars can be turned out and in following years 4,000,000 upward according to plant capacity and public demand. The average age of the cars now in use is estimated as something over eight years; many of them are ten years old or older and are kept going only because of the impossibility of replacing them or finding other means of conveyance. The rate of abandonment for a number of years after the war will be abnormally high. Most market analysts agree that it will be four to five years after the close of the war before passenger cars in operation in the United States will equal the number in use in 1941.

Another undetermined factor that may have a definite bearing upon the course of the oil industry directly following the war is the extent of federal control that may be exercised. Repeated promises have been made that rationing and price fixing will cease as soon as the fighting ends and that the various federal agencies that have been set up to deal with conditions arising from the war will be dissolved as soon as the emergency ceases. Some government officials, however, are disposed to argue that an abrupt change from the present state to one of unregulated competition will result in disturbed trade conditions, dislocation of supplies and inequalities of distribution and that some measure of official supervision is desirable during the period of transition from the arbitrary channeling of products that has been imposed during the war to the reestablishment of normal economic conditions. This consideration, they maintain, applies particularly to international trade since some countries greatly in need of petroleum products will be unable to obtain these without some form of financial assistance which can be more readily provided, they hold, through governmental agencies than by private concerns. This is one of the arguments that has been used in support of the proposal to establish an International Petroleum Commission and it is reenforced, no doubt, by the natural inclination of all government bureaus to retain and extend authority once placed in their hands.





This raises the interesting question of what is likely to happen to the export trade in petroleum in which the United States, prior to the war, held a commanding position. Exporters were few and importers many and of the countries that produced a surplus above their domestic needs the majority were sellers of crude which was shipped to more or less distant points for refining nearer the areas of consumption. The United States on the other hand had built up a world wide system of distribution over a period extending back three-quarters of a century and was a purveyor to every continent and almost every country in the world. Although its shipments of crude to certain countries attained large proportions the bulk of its export trade was in the form of finished products and the growth of its refining capacity which was continuously in excess of domestic needs made this a natural and convenient plan of operation aside from other advantages which it possessed.

In the years immediately preceding the outbreak of war in Europe the petroleum exports of the United States were running close to 200,000,000 barrels yearly and ranged between 10 and 15 percent of total production. In the five years 1935-39 exports were as follows in thousands of barrels:

	1935	1936	1937	1938	1939
Crude	61,176	50,313	67,127	77,272	72,064
Natural Gasoline	1,645	1,904	3,738	6,114	4,111
Gasoline	26,955	26,765	32,269	47,958	42,353
Kerosene	6,462	6,712	8,664	7,261	7,994
Distillate	14,645	18,649	29,011	28,297	30,618
Residual fuel oil	11,395	12,955	12,810	15,536	14,972
Lubricants ..	8,400	8,603	10,839	9,328	1,865
	130,678	125,901	164,458	191,766	173,977

The above tabulation covers only the principal products exported and does not include millions of pounds of grease or other items such as asphalt, coke and specialty products. Examination of the figures reveals some instructive details. In 1938 the last full calendar year before international commerce was disrupted by the outbreak of war in Europe exports of crude, for example, went to the following countries:

Country	Bbl.
Canada	25,606,000
France	16,725,000
Japan	14,163,000
Italy	6,612,000
Others	14,166,000
Total	77,272,000

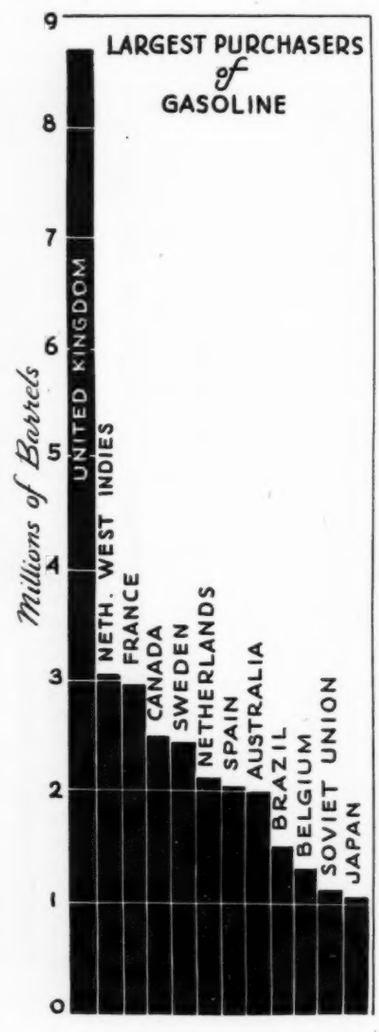
It thus appears that over 80 percent of all crude shipped to outside destinations went to four countries and 27 percent went to two nations with which the United States shortly found itself at war.

Of gasoline the largest purchasers were the following:

Country	Bbl.
United Kingdom	8,736,000
Neth. West Indies	3,052,000
France	2,924,000
Canada	2,473,000
Sweden	2,390,000
Netherlands	2,122,000
Spain	2,052,000
Australia	2,001,000
Brazil	1,460,000
Belgium	1,288,000
Soviet Union	1,120,000
Japan	1,063,000
Total	30,681,000

These twelve countries were the only ones taking more than a million barrels apiece of gasoline and between them they accounted for 62 percent of the total exports of this product. The wide geographical distribution of gasoline shipments is in striking contrast to the small number of large scale purchasers of crude.

In the discussion that has gone on during the past two years over the falling rate of oil discovery in the United States the prediction has been made frequently that in the post war period the country would cease to be an exporter of petroleum. Whatever may happen in the more distant future there is nothing to indicate that anything of the



sort will take place in the immediate post war years. It appears probable that there will be a decided falling off in exports of crude except to Canada which has pipe line connections with the United States and for many years has drawn a substantial part of its crude supply from this country. France and Italy, however, have lost a large part of their refinery installations and many of Japan's plants have been bombed out. Until this lost capacity can be restored, which in the case of Japan may be a great many years, these countries will of necessity be compelled to satisfy their petroleum needs by the importation of products.

A survey of world conditions indicates a shortage in refining capacity outside the United States even to meet a somewhat diminished demand during the next few years. Not only in France and Italy but in practically all parts of Europe except Russia refineries have been the target of repeated air attacks. The Soviet Union is short of processing equipment to meet its own internal needs and has obtained several complete plants from the United States. In the Far East the great refineries on Sumatra and the smaller ones in Burma, Borneo and Java have been more or less completely destroyed and the markets formerly served by these plants will have to depend on other sources of supply for the near future.

In the United States, on the contrary, there has been a great expansion in refinery construction during the war and plant capacity is definitely greater than domestic needs will require for some years to come. With the most efficient equipment that the world has known and with improved techniques emerging from wartime experience it would be strange indeed if this country could not maintain its former position during the near future and well based opinion in the industry holds that the export movement of American petroleum products for the first few years following the war will be approximately as great as in the late pre-war period.

Looking further ahead there is a definite likelihood of changes in this situation. A distinct trend toward the establishment of refining facilities in producing areas rather than in centres of consumption has set in. A great expansion of refinery construction is now under way in the Middle East with additional plants projected for the future. Venezuela has incorporated in its petroleum law a stipulation that companies operating there must refine the greater part of their output within the country and this provision will necessitate the erection of a number of plants along the southern shore of the Caribbean. As new fiields are discovered and brought into production new plants will arise in other parts of the world.

The question as to who will supply the world's needs for petroleum products in the future is one that the future alone can answer.

FOREIGN EXCHANGE AS A FACTOR IN PETROLEUM TRADE

By J. E. Crane, ***Director, Standard Oil Company (N.J.)***

WITH the end of the war comes the necessity of gradually removing government control of international trade and finance and of placing the initiative more and more in private hands. The latent world-wide demand for our exports will be enormous and our productive capacity will undoubtedly increase to record heights. One of the difficult problems will be to provide some of our important foreign customers with adequate means of payment. Most Latin American countries have large supplies of dollars but many European nations have inadequate amounts of dollar exchange on hand and little possibility of increasing their dollar supplies for sometime.

To provide immediate financial help, in addition to the relief available through UNRRA, there will be the Bretton Woods Monetary Fund and the International Bank as well as the Export-Import Bank. In some countries further financial help may be needed for the immediate post-war. In the longer run the United States must import goods and services and lend abroad in sufficient quantities to provide dollars to pay for our exports. The new Reciprocal Trade Agreements Act should help in this connection.

One of the most important steps to restore and maintain international trade is the removal of foreign exchange restrictions which have grown so rapidly throughout the world in recent years. A following review of past experience and conditions encountered by the international oil trade as testimony presented to the O'Mahoney Committee of the United States Senate in June summarizes the experience of the petroleum industry in foreign exchange and indicates some of the problems and needs of the future.

While the foreign exchange experiences of the petroleum industry have been, during the past twenty-five years, numerous and varied, it is possible to classify the bulk of these experiences into certain major groups, and by citing a few examples from each group, to give a fairly representative sample of our problems in this field. The causes underlying our problems in any one of these groups, however, have not always been identical and the full significance of the industry's foreign exchange experience is, therefore, most fully understood only if it is placed against a historical background.

It is more or less common knowledge that the decade following the first World War was one in which there was a gradual return to stabilization of currencies. This return was consummated by countries returning to the gold standard; and it was done in a piecemeal manner, each country making the return when it felt it was ready. In the light of later developments, it is possible that, from at least one viewpoint, the countries placed too much stress upon the need to return promptly to the gold standard, and not enough emphasis upon the repercussions which would flow from fixing the value of their currencies too high or too low.

The failure to act in concert had the inevitable result of establishing a system of exchange rates in which some currencies were overvalued and others were undervalued. To determine even approximate equilibrium rates of exchange is extremely difficult under the most favorable circumstances; under the conditions prevailing in the Twenties, it was impossible. The fact that this period bequeathed us a system of exchange rates subject to stresses and strains only aggravated the exchange difficulties which arose in the next decade.

The Thirties brought a severe depression. The first exchange rates to suffer were those of countries producing, essentially, primary products. This was a normal result: the prices of agricultural products and raw materials are among the more flexible and fall rapidly in depressions. This generally means that the value of exports falls more rapidly than does the value of imports, and a tendency for the currencies of these countries to depreciate is thus generated.

The Thirties are significant, from the foreign exchange viewpoint, for another reason. During this period it was clearly demonstrated that countries were acquiring an increasing tendency to accept as one of their responsibilities that of mitigating unemployment. One way to alleviate internal unemployment, temporarily, is to stimulate exports by depreciating the currency, and this was in fact done, competitively, by a number of countries in the Thirties. In contrast to this, under the pre-1914 gold standard, exchange rates were, in general, stable, but there was less conscious effort to prevent internal price structures from being subjected to pressure from the outside.

In the inter-war period exchange restrictions were used by a number of countries and were first introduced on a large scale by Germany. As a general rule countries have adopted restrictions in order to balance their international payments, but in most cases other objectives have, at least ultimately, been sought. In Germany, for example, exchange control became an important part of their program of preparation for war. In other countries exchange restrictions were employed to promote national industry, to raise revenue, or to achieve other objectives.

The petroleum industry has had foreign exchange experience both as an exporter from and an importer into foreign countries. Our experience in both roles has had substantially the same net result: a considerable increase in costs.

As an exporter, the industry has had two, more or less diametrically opposed, general types of experience. One of these types has been where the long term trend has been towards a strengthening in the value of the currency, interspersed with a tendency towards occasional declines. The most notable example of this is a South American country whose production for export is virtually all of a primary product nature, and in which the petroleum industry has become, over a relatively short period of time, by far the biggest single factor with respect to supplying the country with foreign exchange. It is because petroleum exports have grown more rapidly than the demand for imports has expanded that the rising trend in the value of the country's currency has taken place.

This increasing exchange value has meant that agricultural producers had to lower the prices of their products, in terms of domestic currency, if they wished to sell as much as before in world markets. To overcome this handicap, the country established a system of multiple exchange rates: a high dollar rate for the agricultural producers was fixed, so that they receive a relatively large amount of domestic currency for each dollar they get for their products; and a low dollar rate for the petroleum industry was established, so that the oil companies receive a relatively small amount of domestic currency for each dollar they have to sell in order to meet their local expenses. In effect, therefore, the petroleum industry is bearing the cost of a program to subsidize the country's agricultural producers.

The other type of industry experience as an exporter, has been in countries where exchange control existed in conjunction with a tendency towards depreciation. One of the best examples of this is our experience in a European country. For a number of years exchange control made it impossible to transfer funds to New York without great delay, and when it became possible to purchase dollars, it was necessary to accept a much lower rate of exchange (that is, we had to pay a higher price for dollars).

The general effects of these experiences of the petroleum industry, as an exporter, are fairly obvious. In the first instance, where we retain the dollar proceeds of our exports, the trend towards appreciation of the domestic currency and the imposition of a discriminatory rate have increased our local costs. In the second instance, where we have frequently had to turn the dollar proceeds from our exports over to the exchange control authorities, the combination of exchange control and depreciation has also raised costs and

even independent of any rise in costs, has reduced the dollar return on our foreign investments.

As an importer, the industry has encountered its most tedious problems and almost all of these have been set in a background of exchange control and depreciation, combined. This experience can be broken down into three major groups.

All of that part of Europe in which the industry's affiliates or branches are importers, and in which exchange control was practised, exemplifies the first group. One example of this is the shipping of crude and products to Europe from less economical sources than would otherwise have been used. Transportation difficulties and higher prices made it more expensive, for example, to ship from one European producing area to European importing centers, than to ship from certain areas outside of Europe. In spite of this, it was necessary to supply certain European importers from the higher-cost European producing areas; this, because a clearing agreement between the European countries involved made it possible for us to be paid for such supplies, whereas the European importers could not pay, in all cases, for equivalent supplies from other-than-European sources. In at least one instance, it was necessary, in South America, to supply one country from a higher-cost area than would otherwise have been used, because import regulations prevented further imports from a lower-cost area.

Similarly, it was necessary, in certain foreign countries, for us to purchase materials and equipment, in order to utilize, most effectively, local currencies acquired in payment of oil supplies. To a considerable extent these materials and equipment were normally bought in the United States and were of better quality and cheaper than the foreign products.

A second group embraces those measures which have reduced the return on foreign investments and which would have done so even if costs had not been affected. In certain instances, it has been necessary for the industry to supply countries, and to accept payment for these supplies, temporarily, in domestic currencies. Exchange restrictions delayed the conversion of these currencies into dollars, until the domestic currencies had depreciated substantially against the dollar. This reduced dollar proceeds by a substantial amount. This group can also be extended to cover the numerous cases in which the industry's affiliates or branches were unable to transfer profits, due to exchange restrictions, from countries whose currencies were progressively depreciating in the intervening years.

A final group embraces measures which have not, as yet, actually increased costs materially, but which are a source of potential cost increase, and, therefore, have contributed to an increase in the industry's risk assumption. Because exchange restrictions have prevented dollar remittances, it has been necessary, in certain South American countries, to accept notes, varying in maturity from two to fifteen years, in order ultimately to transfer funds accumulated. So far, none of these notes has come into default, although, subsequent to their issuance, they sold in the market at substantial discounts. The risk of loss is, however, always present.

The general effects of these experiences of the petroleum industry, as an importer, are also fairly obvious. The first two groups have reduced the industry's net return; in one instance, through higher costs; in the other instance, either through reduced dollar proceeds or a direct reduction in the dollar net return.

A discussion of foreign exchange restrictions would not be complete without special reference to the sterling area, because we have here a potential source of serious problems to the industry. The sterling area encompasses a large volume of trade and produces and consumes a great quantity of oil. In this area importers and exporters of petroleum are subject to local exchange controls (similar to those referred to above), but for American oil companies an important aspect of the problem is the control exercised between the pound sterling and the dollar. Owing to the shortage of dollars, the supply of which has been pooled and is rationed by the sterling area, imports of dollar oil not covered by lend-lease have been kept to the barest minimum. Because of that situation, and since American oil companies doing business in the sterling area have followed the wartime policy of the short haul, the industry has supplied consumer markets from sterling sources even though dollar oil was sometimes the pre-war source of supply. But since all the oil that could be produced and transported was needed for the war, the restrictions of the sterling area and the short haul policy did not work a severe hardship on the American petroleum companies. These companies have operated in sterling within the area; and on exports from the sterling area, where dollars have been received in payment, these have been returned to the British Exchange Control, while on imports of dollar oil, materials and supplies required by the petroleum industry and not furnished under lend-lease, London has provided the necessary dollar exchange. Further the British Exchange Control has furnished the dollars for profits made by American companies on their operations in the sterling area. Whereas wartime conditions have prevented this problem from assuming serious proportions up to the present, the American oil companies may be badly hurt in the future unless more liberal commercial policies are adopted.

If, in the immediate postwar years, severe exchange restrictions are in effect in the sterling area, especially against dollar transactions, and if movements of oil are not permitted on a free commercial basis, American oil interests may be at a disadvantage compared with foreign trading companies whose home currency is sterling. Such a development might confront the petroleum industry with the prospect of accumulating blocked currencies usable only in a particular foreign area. In the long run this might prove very embarassing if large amounts of money were involved. The American oil companies have a great deal more costs to meet in dollars than in foreign currency. Unless, therefore, some solution is found to the sterling problem, American petroleum interests may be faced with the dilemma, either of having to accumulate large sterling balances, or of sacrificing their business in the sterling countries.

The foreign exchange experiences of the petroleum industry have all had much the same end result; the risk load, in relation to the return, has been increased and foreign investments have become less attractive. The future development of these foreign investments depends to a large extent on the ability of American companies to compete freely in the sale of crude oil and products in the markets of the world.

Looking backward over the history of foreign exchange restrictions, during the interwar period, it is clear that there are certain objectives for which we might strive. It would, for example, be helpful for the world to reach a system of exchange rates in a coördinated manner. Doubtless many mistakes would be made in estimating long-run equilibrium rates, but it is hard to believe that a worse job would not be done, where each country approached the problem autonomously.

Obviously, a system of stable exchange rates is desirable. But exchange rates can never be successfully stabilized, for long, unless they represent equilibrium rates. We need, therefore, to make every effort to see that, ultimately, equilibrium rates are established, and that international machinery is provided to permit orderly handling of such changes in rates as prove to be necessary.

Even though long-run equilibrium rates were attained in the immediate postwar period, stable exchange rates would not, however, be assured. Cyclical movements can result in a country's currency being, temporarily, too high. Under these circumstances, international currency reserves, adequate to meet the temporary unbalance in the balances of payments, would be necessary; and the required reserves would have to be relatively greater for agricultural and raw-material-producing countries.

In these directions it should be possible to make a substantial improvement over the handling of the problems after the first World War. But it is not in the monetary field alone that cooperative measures are needed. It is important at the same time to improve the underlying economic conditions which have been a heavy contributing cause of disorderly exchanges.

Extreme Left: Service with a Smile.

Left: Car Problems Discussed with Capable Attendants.

Right: Equipment and Merchandise to Properly Service Car Displayed Openly.

POST-WAR CHANGES IN RETAILING

By G. L. Werly

Eastern Marketing Division, Socony-Vacuum Oil Company, Inc.

CONDITIONS brought about by the war have had their effect on the petroleum business from a retail point of view. Consumers, in the short period of four years, have become service conscious. The government with the energetic support of the oil industry, has conducted a vigorous campaign for the conservation of automobiles. As a consequence car owners generally recognize the importance of service in the preservation and efficiency of their motor cars. This wartime lesson which the consumer has learned will carry over to the postwar period, resulting in car owners demanding more complete service and more efficient service at the retail petroleum outlet. This demand must be satisfied by the retail petroleum dealer and it becomes a subject of great interest to the petroleum companies as well as their dealers. The problem involves all phases of retail operations, from the physical facilities at the outlet to the equipment and service procedure followed by the petroleum dealer.

These new consumer demands will be reflected in the postwar service station design. Instead of designing buildings primarily to provide a shelter for the dealer and his employees and covered facilities for lubrication, the postwar station will present a retail complexion. The prewar office will give way to the modern store which is properly illuminated and equipped with effective display fixtures. The lubritory will be laid out on a more efficient basis to impress the car owner with the facilities which are available for his service. The postwar lubritory will not be the catchall of prewar but will be clean, attractive and businesslike in appearance. The rest rooms will be better appointed and designed for easy maintenance on the part of the dealer. The building itself, inside and outside, will be built of materials which will represent a clean, attractive appearance at all times. In this transition of the service station from a gasoline station to a retail business, cleanliness will assume its proper place as one of the cardinal principles of sound retailing.

The postwar motorist will demand more complete merchandise and service because he has learned during the war the necessity of conserving his car and the part that service and merchandise have played in this program. His appraisal and selection of his postwar service station will be greatly influenced by the effective stocking of merchandise and the complete service rendered. Many petroleum outlets prewar had adequate resale merchandise inventories but because of the design and layout of the station, the bulk of this merchandise was stored in stockrooms. Postwar design will bring this merchandise into the open so that the consumer will be impressed with the fact that the outlet is stocked to properly service his car. The same principles which are used in the modern drug store or the super market will be applied in the supply of merchandise at the postwar retail service station. This development of the store facility at the retail outlet should increase the consumer traffic in the station. Prewar surveys indicated that only a small percentage of the motorists ever entered the service station building. Possibly a reason for this condition can be found in the atmosphere which existed, which was not conducive to the development of consumer interest.

Preliminary designs would indicate a new improvement with the show window as a means of displaying merchandise and impressing the customer with the degree of merchandise diversification. Some companies are considering the elimination of show windows as such and using the sales room as the element of interest with large glass areas in the front of the station.

Recent surveys have indicated that the equipment at retail petroleum outlets is generally obsolete and worn out to the point that 75 per cent of this equipment should be replaced postwar.

Equipment takes on a new importance when one thinks of the postwar service station in terms of the consumer demand for service. This equipment must be modern, attractive, well-organized to effect efficient operation and to produce a favorable impression on the car owner. Many of the postwar customers will be the men and women who have served in the armed forces. A large percentage of these ex-service men and women will have a new appreciation of the value of equipment in the servicing of an automobile. The day has gone by when the service station dealer can operate his business with inadequate and incomplete appurtenances. Complete and efficient equipment will be just as important in the building of postwar volume as modern gasoline pumps.

New standards of service must be established at retail petroleum outlets to replace the lower standards which have resulted from war operation. During the war many dealers have become reconciled to poor service and indifferent treatment of customers since car owners generally have recognized the manpower shortage and other contributory causes. Unfortunately, some dealers have taken advantage of this situation to the point that the value of service is no longer recognized as a sound foundation for a retail business. Everywhere we turn we hear of consumers with their "black books" in which are recorded those retailers who have neglected both service and courtesy on the excuse of war conditions. These consumers in postwar will square accounts with such retailers with the result that retail volume will be redistributed to those dealers who recognize this problem and take effective steps to reinstate satisfactory standards of service and operation. Those dealers who move first in this direction will insure their postwar position and profits.

These are only a few of the manifold problems which are presented to the postwar petroleum dealer. These problems all emanate from the conviction that the postwar dealer will be successful in the operation of his business in direct proportion to his ability to follow sound, proven retail practices. This can be accomplished by dealers but at the same time the petroleum companies can be a constructive influence in respect to these problems. New and improved training programs must be available which are soundly conceived and intelligently applied. Those dealers who first give recognition to the changed conditions that lie ahead and who cooperate in the training programs designed to meet the more exacting requirement of postwar markets will develop a profitable business and the petroleum companies that encourage this movement will have effective outlets for the distribution of their products.

Fueling a Canadian-built Mosquito Bomber-fighter.

Montreal Alkylation Plant of Shell Company.

WAR PROBLEMS OF CANADIAN OIL INDUSTRY

By Fred G. Jackson*

WHEN Canada entered World War II in 1939, that nation's oil industry and government were immediately faced with a tremendous problem of providing all the oil products required to meet military and essential civilian demands.

Since Canada is normally an importer of most of her petroleum requirement the problems arising from the effects of war were:

(One) The probability that important supply routes would be severed or at least badly disarranged by the war.

(Two) The certainty of a decided increase in the over-all demands for petroleum products.

(Three) The necessity of meeting the vast increase of war requirements for specialized petroleum products such as aviation gasoline and aviation lubes.

Canada has met these responsibilities sucessfully during the past five years. The military has never suffered for lack of necessary petroleum products. Canadian essential civilian demands have always been met. It has been a story of close and full co-operation between the Canadian oil industry and the Canadian government within the country and, at the same time, a close working in harmony by the Canadian government with the United States and other Allied Nations.

The Canadian oil industry depends for the most part on imported crude oil to supply Canadian refineries. The domestic production provides about 15 per cent of the petroleum requirements of the country, while the remaining 85 per cent comes from the United States and South American sources.

Even though petroleum was discovered in Canada shortly after the drilling of the Drake Well in Pennsylvania in 1859, Canada today has only the Turner Valley Field in Alberta which might be classified as a producing field of first rate importance.

Canadian crude production in 1944 was approximately 8,500,000 barrels, while Canadian military and essential civilian requirements were approximately 71,000,000 barrels. Of this volume, Canada imported from the United States and South American sources approximately 63,000,000 barrels of crude oil and finished petroleum products.

The problems of transportation, which have been overcome in supplying the Canadian economy with oil since 1939, severely taxed the facilities and the ingenuity of the Canadian oil industry and the Canadian Oil Controller's Office.

All crude oil transportation by ocean tankers from 1940 to the end of the war in Europe was extremely hazardous because of the U-boat warfare, yet Canadian requirements for crude oil and petroleum products increased by leaps and bounds under the impetus of war, rising steadily from 49,000,000 barrels in 1939 in approximately 71,000,000 barrels in 1944, despite the severe restrictions imposed on civilian consumption.

The sharp advance in requirements is clearly shown by the following figures for the period from 1937 to 1944. The table includes refinery fuel and loss, as well as a small volume of exports of products from Canada to eastern offshore areas under Canadian supply supervision.

Canadian Crude Oil and Petroleum Product Requirements for the period 1937-1944* (Includes Crude Oil Available to Refineries and Imported Products)

1937	44,975,000
1938	46,486,000
1939	49,645,000
1940	56,877,000
1941	61,318,000
1942	59,818,000
1943	65,688,000
1944	71,625,000

**Statistics Supplied by Oil Controller's Office*

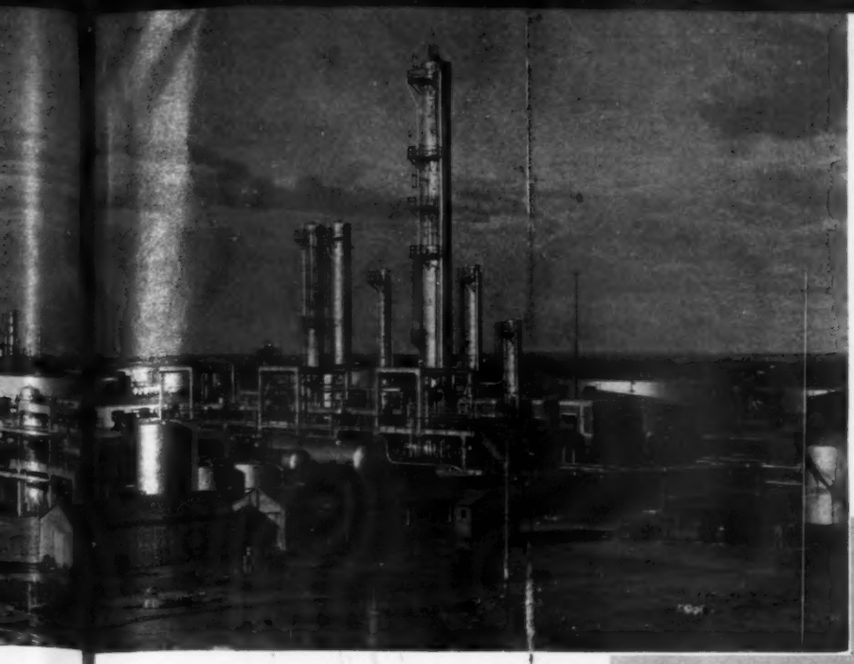
The crude oil supply necessary to meet the demands of the Canadian refineries has been obtained from the following supply sources during the past five years:

Crude Oil Supply for Canadian Refineries 1940-1944*

Source	1940	1941	1942	1943	1944
United States	30,325,168	26,455,891	33,219,372	41,002,729	33,903,290
Colombia	9,742,631	12,623,094	1,520,280	4,379,094	10,464,792
Venezuela	2,046,643	6,281,313	9,336,102	5,526,542	13,073,565
Peru	345,317	909,655	—	—	108,378
Ecuador	—	147,646	—	—	377,127
Trinidad	227,286	160,986	—	—	—
Total Imports:	42,687,045	46,578,585	44,075,754	50,908,365	57,927,151
Domestic Prod:	8,372,004	9,710,218	9,930,900	9,317,274	8,438,911
Total Crude Supply:	51,059,049	56,288,803	54,006,654	60,225,639	66,367,062

**Statistics Supplied by Oil Controller's Office*

Mr. Jackson is the Representative of the Canadian Oil Controller in the Office of Petroleum Administration for War in Washington.



Left: George B. Cottrelle — O.B.E. Oil Controller for Canada.

Below: George M. Davies —Director of Gasoline Rationing.

British American Tanker Pumps Crude Oil Into Storage at Clarkson from Dock Extending Into Lake Ontario.

Above: A. S. Morgan — Executive Assistant to the Oil Controller.

Right: Dr. George S. Hume — Geologist to the Oil Controller.

During 1942 and 1943, at the height of the U-boat warfare on tankers, it became necessary to divert a large portion of the Canadian crude oil demand, usually supplied by South American fields, to United States sources, thereby placing an abnormal delivery load on lake tankers, United States pipeline and tank car deliveries. As the U-boat menace decreased in 1944, it was possible again to return to South American supply sources.

When it became obvious, with Canada's declaration of war, that the task of supplying petroleum products to the nation's expanding industry would be immeasurably greater than anything it had known in peacetime, the Department of Munitions and Supply arranged to set up an agency to work with the Canadian oil industry. On June 28, 1940, the Oil Controller's Office of Canada which became known subsequently by the handier name of "Oil Control" was authorized by law to act as the petroleum division for the department in the over-all supervision and correlation of the oil industry, both with other Canadian industries and foreign oil operation.

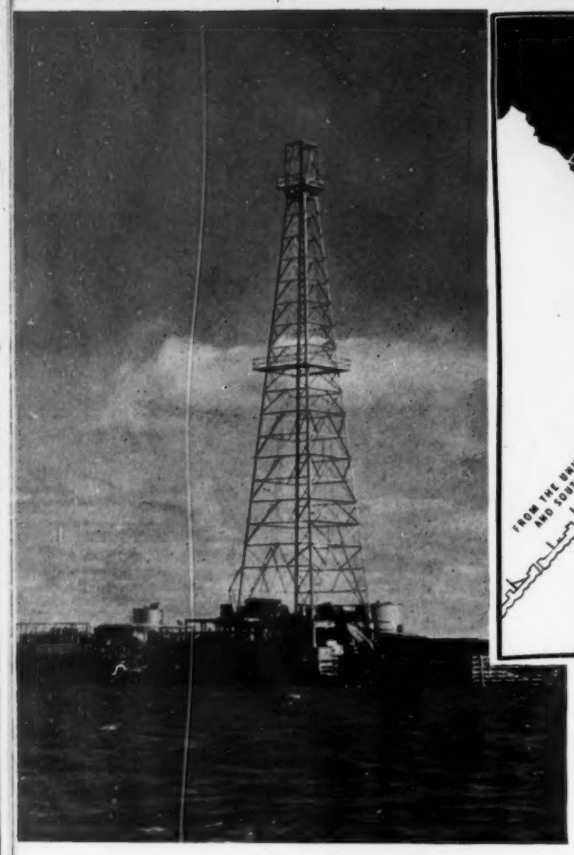
George R. Cottrelle, a Canadian industrialist, was selected by the Minister of Munitions and Supply, Hon. C. D. Howe, to be Oil Controller for Canada. Mr. Cottrelle established the Office of Oil Control in Toronto and began the assembling of a competent staff of experienced oil men to assist him in handling the problems arising from supply, transportation, refining and distribution of oil products to the fighting forces, to Canadian industries and to the civilian population. His Deputy was George H. G. Caulton from the staff of the Socony-Vacuum Oil Company, Inc., until recalled by his company on December 1, 1944. Fred G. Cottle was brought in from the Alberta Conservation Board to head the Economic and Statistical Department. Stewart Armour, later succeeded by George M. Davies, headed the Division of Gasoline Rationing and A. S. Morgan, a fuel engineer, was selected to handle the rationing of fuel oils and asphalts. Also, James K. Jamieson of the British American Oil Company Ltd., worked with refinery and materials problems, until returning to his company in April, 1944. W. H. Rea of Canadian Oil Companies, Ltd., acted as liaison with the armed forces and other government agencies with headquarters at Ottawa until later brought to Toronto as executive assistant to the Oil Controller in April, 1944. G. B. Webster, coming from the mining industry, joined the staff of Oil Control and was afterwards loaned to the Abasand Oils Limited to become its vice-president and general manager.

At the same time various other men joined Oil Control, including Douglas Robinson, a Toronto attorney, who was appointed as personal assistant to the Oil Controller and Charles R. Brasier, who had been connected with foreign oil interests in Romania for more than thirty years, and who was selected in February, 1943, as representative in Washington for Oil Control.

The Office of Oil Controller for Canada was, of course, organized before the United States entered the war. In comparing it to any existing American agencies, it parallels the responsibilities of the Petroleum Administration for War, of which Secretary of Interior Harold L. Ickes is Administrator ex-officio, and Ralph K. Davies of California, the Deputy Administrator; and the Office of Price Administration of which Chester Bowles is Administrator. The Canadian Oil Controller, of course, approximates OPA only to the extent that it rations the use and regulates the price of petroleum products.

The problems facing the Canadian oil industry and the Oil Controller's Office in 1940 were those of organization and co-ordination, but by 1941 these urgent issues had developed and had to be faced:

(One) The necessity of assuring an adequate supply of crude oil to meet Canadian requirements by increasing imports and intensifying the



Above: Outline Map Showing Five Administrative Districts and the Means of Supply.

Left: Test Well of Island Development Co. in Hillsboro Bay Near Prince Edward Island.

search for new Canadian crude production.

(Two) The increase in the production and supply of aviation gasoline, aviation lubes and bunker fuel required by the rapidly expanding Canadian military forces.

(Three) The reduction in the civilian use of petroleum products by means of rationing and conservation, thereby reducing the strain on supplies and limited ocean transportation.

(Four) The establishment of a firm control over prices of petroleum.

(Five) The arrangement for the payment of subsidies wherever necessary to meet extraordinary costs due to wartime emergencies, and thus prevent radical advances in prices of refined products.

Under the aegis of Oil Control, aviation gasoline, refining, transportation, producing and marketing advisory committees were formed, composed of members from the Canadian oil industry and Oil Control. These committees met at least monthly. Their close collaboration proved indispensable.

By 1941, the Canadian oil industry began to feel the full impact of the war on the Canadian economy.

It was evident that the decision to make Canada the hub of the Commonwealth air training plan would entail the training of a tremendous number of fliers and aviation personnel from all sections of the British Empire.

Canada was ideal for this purpose. It was close to petroleum sources. Food supplies were more readily available than in England. Much of its terrain was suitable for airfields with a minimum of construction and its climate provided a highly favorable average of good flying weather. Consequently, fields were established throughout Canada and the training of several hundred thousand men was accomplished, thus making Canada the "Airdrome of Democracy".

At the same time, Canada, because of its geographical position, was the "jumping off" point between the United States, Alaska and Siberia on the one hand, and the United States and Europe on the other. Again, convoys forming at Canadian east coast ports required air protection. All this resulted in a hundredfold increase in the demand for aviation gasoline in Canada. Requirements for aviation lubes expanded similarly.

The Canadian Navy was greatly expanded. Naval units were increased from 15 in 1939 to over 650 in 1944. Assumption of a large part, and eventually all, of the burden of convoy protection from the East Coast of the United States and Canada to England resulted in heavy demands for naval fuel for escort ships and bunker fuels for merchant ships at Canadian ports.

Canadian war plants were also established in large numbers, and Canadian output from mines and factories more than doubled in the period of 1938 to 1944. Rail transportation, necessary to meet the requirements for products overseas, together with the carrying of troops, placed a heavy strain on the railroads of Canada, and at the same time required greatly increased volumes of heavy fuel oil.

All these emergency demands for petroleum products have been met by the Canadian oil industry in collaboration with Oil Control by a program of strict economy of consumption on the part of the civilian population on the one hand, and by greatly increased imports of crude oil for processing in Canadian refineries on the other hand. Wartime demands were responsible for an increase of approximately 60 per cent in Canadian petroleum imports, with Canadian refineries producing 96 per cent of the products required — only four per cent were finished products.

To meet these extraordinary demands, the Oil Controller, in collaboration with industry, recommended to Minister of Munitions and Supply C. D. Howe that plants be built in Canada to provide at least a portion of the vital aviation gasoline components required.

As a result, it was decided that two alkylate plants be built, one at Calgary and the other in Montreal East. Both plants are in operation and have been able to aid in the production of approximately 40 per cent of Canada's war-time requirements of 100-octane aviation gasoline. Furthermore, three cumene plants have been built and placed in operation.

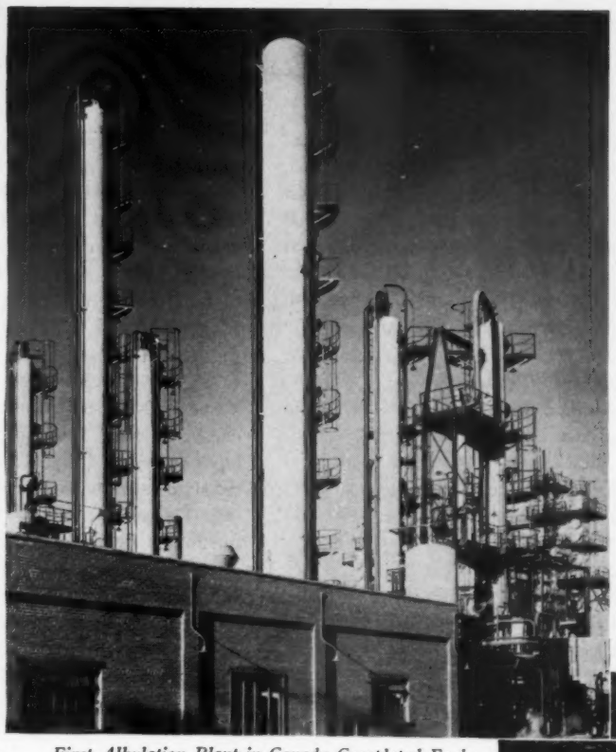
In the fall of 1943, the British American Oil Company completed and placed in operation its new 10,000 barrel per day refinery at Clarkson, Ontario. This plant was pushed to completion with the express purpose of meeting aviation gasoline and aviation lubricating oil demands. The Oil Controller's office, together with the Petroleum Administration for War in Washington, aided in securing the critical materials needed in the erection of this completely modern refinery.

All refineries in Canada have been modernized wherever possible. Refinery runs today average 180,000 barrels per day, as contrasted with 110,000 barrels a day in 1938.

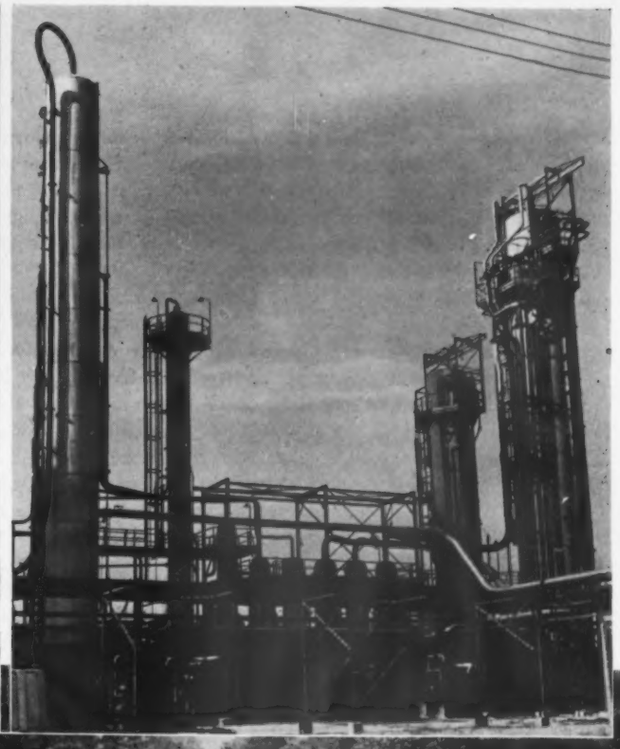
The Canadian government, realizing the seriousness of the rubber shortage, created in 1942 the Polymer Corporation, Ltd. for the purpose of erecting a synthetic rubber plant. This was done adjoining the Sarnia Refinery of Imperial Oil Limited and went into operation in 1944. This plant has a rated capacity of 34,000 tons per year,

. Harold Rea—Executive Assistant to the Oil Controller.

Top: Fred G. Cottle—Executive Assistant to the Oil Controller and Deputy Oil Administrator, Wartime Prices and Trade Board.



First Alkylation Plant in Canada Completed Early in 1943 at Imperial's Calgary Refinery.



Top Right: Section of Clarkson Refinery Showing Crude Topping Tower (left) and Lube Oil Vacuum Towers.

Right: As a War Measure a Pipeline was Constructed from Portland, Maine to Montreal.

and depends upon refinery feed stocks as the base for synthetic rubber production.

Canada was divided into five districts for purposes of administration and control. These districts, set up in large degree on the basis of their crude sources and means and method of supply, are as follows:

District 1, comprising the Maritime Provinces of Prince Edward Island, New Brunswick and Nova Scotia, which is supplied by tanker shipments of crude from Venezuela and Colombia to the one refinery at Halifax which processes an average of 20,000 barrels daily.

District 2, the Province of Quebec, which has four operating refineries at Montreal processing an average of 45,000 barrels daily. Prior to 1941, crude for these refineries was brought into Montreal by ocean tanker by the way of the St. Lawrence River. As the St. Lawrence River is frozen for five months each year it had been necessary to store during the summer a sufficient quantity of crude to supply the refineries during the winter. With the completion of the Portland-Montreal Pipeline in October, 1941, the supply problem at Montreal was considerably simplified. Today, tankers from South American points and from the United States Gulf Coast unload at Portland, the crude being shipped from Portland to Montreal by pipeline. The completion of the pipeline made possible an all-year-round crude supply operation. It eliminated the necessity of stockpiling crude at Montreal. Also, by shortening water distance from South America to Montreal by 32 per cent, it diminished U-boat dangers and released the equivalent of six tankers for other service.

District 3, the Province of Ontario, which has five operating refineries processing an average of 60,000 barrels daily and is almost entirely dependent on crude oil brought in from the United States, supplied mainly from Illinois and Mid-continent fields. A portion of the supply for Sarnia, Canada's largest refinery, is transported by pipeline; the balance for Sarnia and the other Ontario refineries is brought to U. S. lake ports by pipeline and tank car shipments, and from these ports distributed to refineries in Canada by small tankers. There is a few hundred barrels per day of crude oil production in Ontario Province.

District 4, comprising the Provinces of Manitoba, Saskatchewan and Alberta, which has refineries processing approximately 35,000 barrels daily, and secures about 60 per cent of its total requirements from the Turner Valley field. This is supplemented by additional small production from Vermilion, Taber, Conrad and other minor fields in Alberta. However, since 1942 it has been necessary to increase imports from 4,000 to 13,000 barrels per day from the United States. The Turner Valley field reached its peak of production in 1942 while demands of the refineries have continued at a high level with a consequent increase in crude imports from American fields to offset declining Canadian production. Previous to 1943 the Montana fields were able to supply the additional needs of Prairie provinces. However, with increased requirements for Montana-Wyoming sweet crude oil within the Rocky Mountain area it was necessary in 1943 for the Canadian companies to go further afield, hauling crude by tank car from as far as the Gulf Coast of the United States.

District 5, British Columbia, which has three operating refineries that process approximately 20,000 barrels daily, has usually depended on California crude oil supplies. In 1944, due to the increased demands of California refineries and declining crude oil stocks in California, the Canadians diverted almost half of their daily crude oil demand from California to South American sources. At present, 9,000 barrels per

day is imported from Ecuador and Colombia, the remainder being supplied by California fields. Eventually, if tanker transportation becomes available and California crude oil stocks drop to a dangerous level, it may be necessary to replace the California supply entirely with South American crude.

only important pipeline importing crude into Canada, other than the Portland-Montreal line, is the one to the Sarnia refinery. This line can transport only 30,000 barrels a day of the 37,000 barrels required by the Imperial Refinery at Sarnia.

Canadian Refinery Operations and Crude Supply — 1944

	Refineries in Operation	Approx. Aver. Daily Runs-Bbls.	Prin. Crude Supply Source	Primary Transp. Method for Crude
District 1:	One	20,000	Colombia Venezuela	Ocean Tankers
District 2:	Four	45,000	Colombia Venezuela	Ocean Tankers & Portland-Montreal-Pipeline, Tank Car & Lake Tankers
District 3:	Five	60,000	U. S. A.	
District 4:	Eight	35,000	Canada U. S. A.	Pipeline & Tank Car
District 5:	Three	20,000	Colombia Ecuador U. S. A.	Ocean Tankers
Total CANADA	Twenty-one	180,000		

Tank car movements of crude oil into Ontario and the Prairie provinces from the United States have been increased by 11,000 barrels per day since 1940. Also, the vast increase in manufacture and consumption of aviation gasoline and aviation components has required the daily use in Canada of hundreds of tank cars, many of which were supplied by tank car transportation companies in the United States.

Faced with increased crude requirements and declining domestic crude production, the Canadian oil industry and the Canadian government decided to take steps to promote exploratory drilling. Domestic production has fallen from its maximum daily rate of approximately 28,000 barrels per day in 1942 to approximately 22,000 barrels daily by the middle of 1945. The Turner Valley field has been the only major source of crude supply in Canada since the discovery oil well was drilled in 1936.

A decision was made not only to attempt to increase the production from the Turner Valley

Even in peacetime Canada consumed more petroleum products per capita than any country except the United States. The life of the country has been geared, like that of its neighbor to the south, to the auto and the power of the internal combustion engine.

George H. G. Caulton —Former Deputy Oil Controller for Canada.

Section of Polymer Plant of Imperial Oil Co. at Sarnia.

Below: British Battleship Fuelled by an Imperial Oil Tanker.

The first pinch on crude imports was felt when convoy requirements decreased the operating effiency of all tankers. When enemy submarines were taking a heavy toll of oil tankers early in 1941, the British government requisitioned all British flag tonnage, in addition to absorbing all obtainable neutral flag tonnage. This was quite a blow to Canadian oil companies since they depended on neutral tonnage for a considerable portion of their deliveries to both Halifax and Montreal. With the entrance of Japan into the war in December, 1941, British Columbia crude supply problems became increasingly acute. For a time stocks of crude were difficult to maintain.

Since Canada also needed lake tankers and tank cars to supply its interior refineries so that they could step up operations, the Oil Controller and the Canadian oil industry made plans at once for building several ocean tankers, a number of small lake tankers, and tank cars to handle both crude oil and specialty petroleum products.

A program was proposed in 1942 for the construction of six small lake tankers and twenty large ocean-type tankers. However, due to urgent requirements for dry cargo ships which developed simultaneously, the program was modified. The six tankers were built, but only thirteen ocean tankers constructed. They were placed in service by March, 1944.

As a result of tanker sinkings off the East Coast, it became necessary to move larger amounts of crude and products by pipeline and tank car. The

field, but also to increase exploratory operations throughout the Dominion. The Oil Controller proposed that the government:

(1.) Grant tax concessions to oil operators to encou age increased drilling.

(2.) Formulate a prog am of geophysical explorations supported by the Canadian government to outline likely areas for exploration and to supplement the vast amount of geological work done both by the Canadian government and by Canadian oil companies.

(3.) Establish Wartime Oils Ltd., an organization which would assist in drilling marginal wells in the Turner Valley field.

(4.) Set aside funds fo: exploration and testing of the vast tar sand deposits of northern Alberta, and

(5.) Revise leasing and royalty regulations of the provincial and Dominion governments to encourage exploratory drilling.

The Oil Controller secured Dr. George S. Hume from the Canadian Geological Survey to assist in furthering exploration in Canada.

In car ying forward this program, the largest number of test wells ever completed in Canada in a like period were drilled from 1941-1944. Unfortunately, few were successful. Tests were drilled, for example, by Canadian and American companies in the P:ovinces of Prince Edward Island, New Brunswick, Nova Scotia and Quebec, without worthwhile results.

Present operations in Hillsboro Bay, Prince Edward Island, are the result of the discovery of Hugh Mackay, a noted prospecto:, who found what he believed to be favorable geological structure on Prince Edward Island, and the Cities Service Company test drilling in 1928. However, equipment was not available to go deep enough to penetrate all possible oil horizons, so test operations were discontinued. In 1942 the Socony-Vacuum Oil Company joined Cities Se:vice on a 50-50 basis to conduct further investigations, and in April, 1943, the two companies started drilling. The operations are being conducted by the Island Development Company, a subsidiary of Socony-Vacuum, and the drilling is being done by Loffland Bros. Company of Tulsa. This test well is located eight miles south of Charlottetown in Hillsboro Bay, where seismographic surveys indicated the crest of the anticline. Before drilling was started, an island had to be built on the anticlinel crest, in open water, having a depth of 16 ft. at low tide and 26 ft. at flood. Eleven miles of logs were used to construct walls of a crib, and 8,000 tons of rock and concrete were put into it to form a surface area of 9,000 sq. ft. Weather conditions are so severe that winter drilling has been impossible. Operations have reached a depth exceeding 12,800 ft. without results to date. Equipment is available to drill to a depth of three miles.

A few shallow wells were drilled in Canada's earliest producing center in Western Ontario, but these, even though productive, were of negligible importance.

Several tests have also been drilled in Saskatchewan du ing the past few years, but here again only small production was obtained.

On the other hand, additional production was developed in the Mackenzie River Valley area. The United States Army carried out the Canol project in the Norman Wells field. Some 58 wells were drilled. Fifty- four were productive in commercial quantities. Four productive wells had been drilled prior to the Canol project. Several wildcat wells on other structures failed.

In Alberta, production of heavy crude of 14° and 18° gravity respectively was found at Vermilion and Taber, but the daily production for the two areas is less than 2,000 barrels. This crude serves principally as railway fuel and cannot replace Turner Valley crude oil in refinery operations.

Lloydminister, east of Vermilion, shows some promise of additional heavy crude production, while at Conrad, south of the Taber field, production of 25° gravity crude has been opened in several tests and a field of commercial importance established. None of these however is likely to offset the decline in Turner Valley production, either in quality or quantity.

Entrance to Administration Building, British-American's Clarkson Refinery.

Douglas Robinson — Assistant to the Oil Controller.

However, two strikes of great promise to Western Canadian oil men were made recently. One was by the Standard of California at Princess, where 35° gravity production was found in the Devonian, and the other was a distillate discovery by the Shell Oil Company in the Jumpingpound area, 20 miles west of Calgary.

The Princess production in the Devonian is of prime importance, since it opens the great plains area of western Canada to exploration.

The Jumpingpound area is structually quite similar to Turner Valley. Being productive in the Mississippian Limestone at a completed depth of 9,947, the well appears to be near the crest of a large anticline. It produced on test large volumes of gas with varying amounts of distillate ranging from 47° to 56° A.P.I., depending on the applied back pressure at the surface. This area has excellent possibilities of developing major production, which might fully offset the decline of Turner Valley. A further test is being drilled downstructure from the discovery well.

With the completion of Royalite No. 4 in 1924 at a total depth of 3,740 feet with an initial flow of 20,000,000 cubic feet of wet gas containing distillate, the Turner Valley field was proven as a distillate producer from the Madison lime of Mississipian age. Previous small production had been obtained from cretaceous horizons. For a number of years distillate was taken from this structure with a tremendous waste of natural gas. On June 16, 1936, the Turner Valley Royalties No. 1 was completed downstructure from No. 4 and below the gas-oil contact of the field producing initially about 850 barrels per day of 44° A.P.I. dark oil with a low gas-oil ratio.

Thus, Turner Valley was proven as an oil field with a gas cap, rather than merely a gas reservoir containing a large volume of distillate naphtha. Maximum oil production of the field was reached in 1942 with 10,003,985 barrels from oil wells, gas wells and gasoline plants, but the decline in production which set in since that time has continued despite a drilling program which was partially supported by government assistance through Wartime Oils. Production for 1943 was 9,452,697 barrels, but it declined to 8,326,316 barrels in 1944. Total cumulative production of the field had reached 73,000,000 by 1944 and estimates of ultimate recovery have ranged from 105,000,000 to 200,000,000 barrels.

The limits of the field are practically defined and only a few additional new wells are expected. If the present decline continues, production from Turner Valley will average less than 20,000 barrels per day in 1946. Since the crude oil demands of the Prairie provinces exceed 35,000 barrels per day, Turner Valley even at the height in 1942 did not meet this requirement.

Early in 1943 when it became apparent that Turner Valley production had passed its peak

South End of Turner Valley at Anglo Canadian Buildings.

Davies No. 2 Well.

and also that Montana and Wyoming would not alone be able to supply all of the remaining crude required by the Prairie province refineries, Oil Controller Cottrelle advocated the formation of a government-supervised company to finance the drilling of wells in the central portion of Turner Valley where the companies hesitated to drill due to the low degree of saturation in the producing horizon. Oil Control took the position that even though small production was obtained from these wells and they might not be a commercial success, yet they would add to the Canadian crude supply and reduce accordingly the volume of crude coming by tank car from across the border. Therefore, in any strict evaluation of wartime oil operations, it must be remembered that this production replaced crude oil which cost the Canadian government a minimum of one dollar per barrel more than the posted price of Turner Valley crude, due to the subsidized rail transportation expense.

During 1943 and 1944 Wartime Oils drilled 22 wells and secured production in 21. The lone failure was due to lack of porosity in the producing zone. Average daily production per well from Wartime Oils drilling operations has been 88 barrels as contrasted with an average of 122 barrels daily from new wells drilled in 1943-44 in the more promising portion of the field by private operators.

However, wells drilled by Wartime Oils are expected to produce ultimately two or three million barrels of oil which otherwise would not have been produced. According to Dr. Hume, wells drilled by Wartime Oils are expected to produce about eight per cent of the total production of Turner Valley in 1945, and will reduce by the same amount the volume of crude which must be transported from south of the border, thereby helping to alleviate tank car transportation shortage both in Canada and the United States.

The Alberta government organized the Petroleum and Natural Gas Conservation Board on July 1, 1938, to handle Alberta oil problems. The first board was composed of W. F. Knode, petroleum engineer and geologist of Texas, and C. W. Dingman and F. G. Cottle of Alberta. The board took steps immediately for the regulation of production and conservation of gas in the Turner Valley field. The board was reorganized in September, 1940, under the chairmanship of Robert E. Allen of California, with Mr. Cottle and J. J. Frawley of the Alberta Attorney General's Office, as members. A survey was made of the production possibilities of the field and a daily production rate of 22,000 barrels was established in January, 1941.

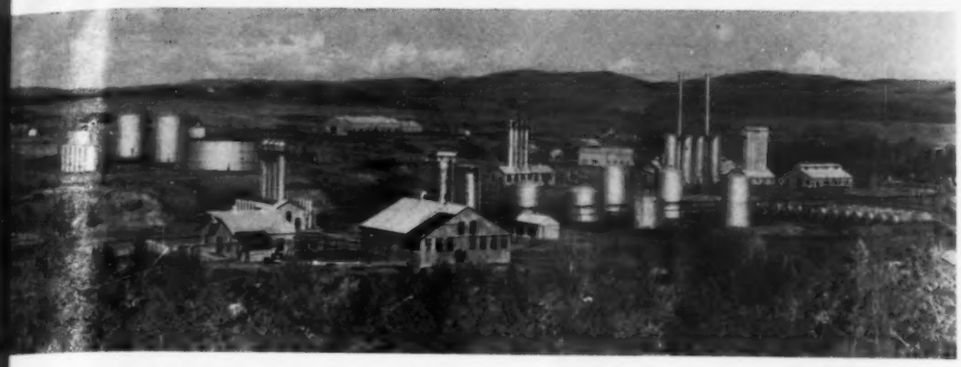
It was necessary to reorganize the board again in June, 1941, when Mr. Allen was called to Washington to be Assistant Deputy Petroleum Administrator of the Petroleum Administration for War, and Mr. Cottle became Assistant to the Oil Controller of Canada in Toronto. Mr. Frawley became Chairman, with Dr. George Granger Brown, of the University of Michigan, becoming the petroleum consultant. Dr. Brown made a careful study of the field reservoir conditions and presented his final report to the board on June 26, 1942.

A plant for the pro-rate production of the field based on a daily average withdrawal from the reservoir of both oil and gas equivalent to 25 barrels of fluid was proposed. This plan was adopted with a few modifications, and Turner Valley production has been so regulated since that time.

The Oil Controller has encouraged private companies to carry on geological and geophysical investigations. Dr. Hume has worked closely with the companies in forwarding an extensive survey of oil possibilities throughout Canada. At the same time, the Canadian government has financed additional exploration work, the information being made available to the industry so as to encourage exploratory drilling. The fruits of this policy are shown by the increased drilling activity in Canada, though as yet, no large and important field has been proven.

As a result of this aggressive action, millions of acres of prospective Canadian oil territory have been taken up by the Canadian and American operation oil companies and programs for both geological investigation and exploratory drilling have been set up by these companies. The importance of the Canadian oil possibilities as a future supply for American and Canadian refineries cannot be over-emphasized. In view of the vast extent of untested sedimentary territory in Canada and the aggressive policy of encouragement for oil prospecting being followed by the Canadian government, it is within the realm of possibility that in years to come Canadian oil fields may become an important source of crude oil supply for American refineries. The present position of the two countries oilwise might be partially reversed and the United States become an importer of crude oil from Western Canada. Crude oil reserves in Canada are of equal importance in the over-all defensive policy of the western Hemisphere with reserves in the United States.

No resume of Canadian oil possibilities can be complete without mention of the famous and much publicized Athabaska tar sands. These sand deposits extending for nearly 150 miles along the banks of the Athabaska and Clearwater River of Northern Alberta, have been estimated by geologists as containing a fabulous supply of hydrocarbons in the form of heavy oil of approximately 10° A.P.I. Estimates of the oil content



Top: Royalite Plant and Wells. *York No. 1 Well.*

of these sands range from one hundred billion to three hundred billion barrels, though admittedly a great percentage of this oil could not be recovered due to the great overburden of shale covering most of these deposits.

Pioneer work in the separation of the oil from these sands and refining of the oil to secure petroleum products was carried on by Abasand Oils Ltd., under the direction of Max W. Ball, American geologist and engineer, from 1930 to 1943. The work was carried forward with private funds, but the feasibility of large-scale extraction and refining operations which were essential before these deposits might provide any appreciable supply of petroleum products for the war program had not yet become measurable.

In order to advance the investigation and establish the importance of these sands in the present and future world petroleum supply picture, the Canadian government took over the operations of Absand Oils early in 1943, spending approximately one and a half million dollars in the reconstruction of a commercial scale pilot separation plant and refinery capable of producing and processing 600 barrels of oil per day. At the same time, core drilling investigations have been made by sampling some of the larger and richer deposits along the Athabaska River. These core sample established the fact that there exists a wide variance in the richness of the deposit and of the amounts of shale interlayed with the beds. Recently, the extraction plant was destroyed by fire and the refinery is not now in operation. It seems evident that only a negligible quantity of petroleum products can be supplied from these sands within the immediate future, and these at a cost above the prices of present world petroleum supplies. Processes for readily extracting oil from these sands have not yet been perfected or the prices at which products can be made yet determined.

On July 14, 1941, the first attempt to restrict the sale of gasoline to civilian consumers in Canada was attempted and a public appeal was made to save gasoline, followed by a system of quotas restricting deliveries to dealers. The hours of sale were restricted to the daylight hours of weekdays. Civilian demands were reduced about 20 per cent by this method. However, with the increased difficulties in transportation of crude oil to Canada, and the mounting requirements for military it became necessary to make further restriction on gasoline consumption by civilians and a method of control was evolved.

In January, 1942, twelve regional officers were established by the Oil Controller throughout Canada for the purpose of rationing gasoline. The rationing of gasoline by coupon books went into effect on April 1, 1942. After one year of experience, the plan was revised on April 1, 1943. Rationing of gasoline in Canada continued until its elimination on August 15, under the same plan of regulations as imposed at that time. The basic AA ration granted to each Canadian motorist provided sixteen U. S. gallons of gasoline per month for each car in use. However, unlike the basic A ration in the United States of twelve gallons per month this ration was used for a considerable amount of essential driving which under the United States system warranted supplemental rations.

The Canadian system divided the driving public into six categories of essentiality, and issued supplemental rations only under conditions meeting the requirements laid down in each classification. All questions of essentiality were determined by the regional directors, employees of Oil Control, and rationing was not handled by local boards composed of volunteer, unpaid citizens as in the United States. The Oil Controller's office which was in charge of gasoline and fuel oil rationing approached the Canadian rationing question with the view to the widest distribution possible of available gasoline, at the same time restricting the disbursement of supplemental gasoline to as small a number as compatible with maintaining the transportation services and economy of the country. The results were that the average annual consumption by the Canadian civilian motorist under rationing was approximately 85 per cent that of the average consumption by the civilian automobile in the United States.

The first attempt to restrict the use of fuel oil was made by the Oil Controller on September, 2, 1940, prohibiting the installation of oil burning equipment for any purpose which would consume over 4,000 gallons of oil annually.

While the response to voluntary appeals for conservation was excellent it was inadequate to meet the fuel oil demand on Canada's rapidly expanding war effort. So that all be treated alike fuel oil conversions were made mandatory. All users of fuel oil were advised that the use of fuel oil for the heating of all types of buildings, including factories, warehouses, banks, office buildings, schools, churches, hospitals, institutions, apartment and boarding houses, provincial and federal government buildings, armed forces' cantonments, barracks and administration offices, would no longer be available after July 31, 1942.

Notwithstanding this conversion and other economy steps, the use of fuel oil increased 62.8 per cent for the year ending June 30, 1941, as compared with the peacetime year ending June 30, 1938. This was due entirely to heavy increases in the demands of the Navy, Merchant Marine, railroads and war plants. The use of light fuel oil was restricted to bonafide residence. As the supply position of heavy fuel oil improved the ban on its use has been relaxed following the pattern of relaxation taken in the United States.

The Canadian oil industry and Oil Controller's Office have worked very closely with the American agencies during the entire war period. As Canada has been a large supplier of wartime products to the United States, principally nickel, aluminum, wood pulp and other items, so the United States has shared with Canada its oil resources and available pipeline, tank car and tanker transportation facilities.

The close co-operation between the two countries has made possible the fullest utilization of joint resources in meeting the wartime demands imposed upon their economies. The line between Canada and the United States has been ignored to a great extent. Because of the close and friendly co-operation between the Office of the Oil Controller for Canada and the Petroleum Administration in Washington it has been possible to carry forward necessary programs with a minimum dislocation of effort.

BRAZIL HAS FOUR OIL FIELDS WITH 25 PRODUCING WELLS

By Dr. Avelino Ignacio de Oliveira

DURING 1938 the government of President Getulio Vargas undertook the preparation of a new statement of the basic principles of mining law in keeping with its philosophy of national interests. The principle was adopted that subsurface property should be employed solely for the benefit of all the people. With the pronouncement of this principle the owner of the surface lost his right to the subsurface. This political measure served to remove many of the obstacles which had hindered the development of mining properties and opened the way for the exploitation of our mineral resources.

The national government undertook the development of the petroleum resources by continuing drilling operations which were under way in the Parana Basin and commencing geological surveys in the Territory of Acre, which is geologically the region giving the greatest promise of extensive petroleum deposits, in all the country.

In 1938 the National Petroleum Council (Conselho Nacional do Petroleo) was organized under the direction of Colonel Joao Carlos Barreto as president. This new board, in 1939, assumed the entire responsibility for exploration, production, refining, control of commerce, distribution of products and the development of international treaties relating to petroleum.

The original geological studies carried out in the last century by the pioneers of geology in Brazil, C. F. Hartt, A. Orville Derby and R. Rathbun and continued by others and later by geologists of the National Petroleum Council indicated that several structures in the vicinity of La Bahia de Todos os Santos had possibilities of commercial production. This region occupies the southern part of the Reconcavo da Bahia which is a large graben limited on the east and west by great faults along which Mesozoic sediments lie in contact with Archean rocks. The surface and upper sedimentary beds are Cretaceous in age with Jurassic and probably older formations lying below.

These sedimentary formations show noticeable folding with axes roughly parallel to the major faults. There are other systems of lesser faulting in the graben associated with anticlines on which oil fields have been discovered. Possibly other structures containing oil will be revealed by the continuation of geological and geophysical surveys and drilling.

The Conselho employed the services of Drilling and Exploration Company, Inc., an American drilling company, with tools purchased by the Conselho. Later an American geophysical company, United Geophysical Company, was employed and two seismograph parties placed in the field. The first wells were drilled in the states of Bahia and Alagoas and the geophysicists were

Dr. Avelino Ignacio de Oliveira, Chief Geologist and Member of the Executive Committee, National Petroleum Council of Brazil.

first assigned areas for survey in Alagoas and later moved to Bahia.

Several dry holes were drilled in the state of Alagoas though good showings were found in two of the wells. In the state of Bahia near the city of Salvador four oil fields were found in following order: Lobato, Candeias, Aratu and Itaparica.

The Lobato field in the northern part of the city of Salvador and near the bay is of importance principally because it contains the first well to penetrate an oil producing horizon in Brazil. The 650-foot sand yielded a few gallons of oil daily. Several additional wells were drilled, seven of which were producers. The geological structure is a relatively steep monocline dipping westerly from the major eastern fault. This monocline is interrupted by blocks separated by faults parallel to the major features and cut by cross faults.

The producers have yielded approximately 65,000 barrels of oil since 1940, most of which has come from Well No. 15. This well was completed in 1941 as an 80 barrel pumper and will now make the same quantity when newly cleaned out. The oil is of very high paraffin content with very little sulphur and a high pour point. Gravity is about 30° API.

The Aratu field is located 15 miles north of the city of Salvador and is an elongated dome on a short anticline lying somewhat more than a mile to the westward of the northward extension of the Lobato fault. It is apparently cut on the east side by a lesser fault. This field has two producing horizons, the upper of which lies between 1500 and 1600 feet below the surface and produces oil. The second is some 500 feet lower and produces gas.

Well No. 1 in this field was drilled to the crystallines at the fault contact at about 6000 feet in depth. The sediments consist of dark gray shales with conglomerate lenses, hard sandstones, salty sandstones and sandy limestone. Many of the beds are very hard and practically the entire section had to be drilled with rock bits.

The oil producing area at Aratu is a lens of silty sandstone occurring on the southern end of the anticline. It is some 60 feet thick and covers not more than thirty or forty acres. Only wells Nos. 1, 2 and 6 encountered the oil sand and together had a potential of approximately 100 barrels daily. Wells Nos. 1 and 2 have produced approximately 50,000 barrels of oil, which is 44° API gravity of a paraffin base and very low sulphur content. Well No. 1 is presently flowing at the rate of 15 to 20 barrels daily, while No. 2 pumps at about the same rate.

The gas sand which occurs some 500 feet below the oil sand has eight producing wells varying in capacity from one to eight million cubic feet daily through 2-inch tubing. The static pressure at the casinghead is 1070 lbs. The gas sand is about 100 feet thick and covers approximately 1000 acres. A total of 13 wells has been drilled in the field, three of which were non-productive delimiting edge wells.

The Candeias field is some 15 miles northwesterly from the Aratu field and 22 miles northwest of the city of Salvador. As presently known the Candeias field is an asymmetric anticline with steep dips to the east and gentler dips west.

Well No. 1 was drilled in 1941 to approximately 6000 feet, the capacity of the small power rig used on the job. The location is about one mile west of what is now the highest known part of the fold. The well is cored continuously below 2000 feet and a 50 foot oil sand was found at 3800 feet. The section encountered in this well consists of about 400 feet of shales carrying thin beds of sandstone below which there occurs a massive silty sandstone approximately 3000 feet thick. Below this sandstone is a 400 foot section of blue shale beneath which is the oil sand. Below the oil sand and to the bottom of the hole principally shales with a few sandstones were encountered.

Fifteen wells have been drilled in Candeias, eleven of which are producers and four of which are delimiting dry holes. Wells Nos. 1, 2, 3, 4, 6, 8, 9, 10 and 11 have potentials which vary from 40 to 200 barrels of oil daily, pumping and flowing. No. 13, structurally the highest well in the field, produces 15 barrels an hour through a one-half inch choke and No. 16, which is approximately one and one-half miles to the southward, produces 18 barrels an hour through a five-eighths inch choke. Well No. 6, which is

Map of Brazil Showing Location of Four Producing Fields thus far Developed and Location of Unsuccessful Exploratory Work.

some 4000 feet deep and one mile west of well No. 13, is 1300 feet lower structurally than the latter well. Well No. 16, which is about 2600 feet deep and one and one-half miles to the southward of well No. 13, encountered the producing horizon at a 30-foot greater subsea depth. The gravity of the oil in well No. 6 is 29° API and in well No. 13 it is 37° API. Wells between these two in structural position show increasingly lighter gravities as the upper part of the structure is approached. The producing section is about 100 feet thick with 40 to 60 feet net of a hard, coarse sand or grit, frequently silty in part.

This Candeias structure has not as yet been delimited except on the west and north where the sand pinches out. The present proven area within the limits of the producing wells is approximately 1000 acres. It is probable that the producing area will be considerably more extensive, especially to the southward of No. 16. The Candeias field has produced approximately 75,000 barrels of oil and has a present daily potential of about 1200 barrels, though because of paraffin difficulties this rate of production cannot be maintained with the present wells. Based on 25-acre spacing the field has upward of 30 proven locations. The gas-oil ratio is quite low though there is a 20-foot gas cap in No. 13.

The Itaparica field is located on the extreme north end of the island of that name ten miles across the bay from the city of Salvador. There are two sands, one which produces gas in the up-dip or westward part of the sand lens and oil in the down-dip or eastern parts of the lens. The western flank of the anticline has not been definitely proved except along the axis. The lower or oil producing sand is some several hundred feet thick with oil occurring in the upper 30 feet only along the crest of the structure. The area of production as presently known and under land will not exceed 200 acres.

Six wells have been completed in the upper or gas sand which is 70 feet thick at a maximum. Continuing down dip from the gas area oil has been encountered in four wells. The smallest of these, where the sand is 20 feet thick, produces about 50 barrels daily. The largest, which has some 65 feet of sand, flows 18 barrels per hour through a five-eighth inch choke. The gravity of the oil is 37° API with high paraffin content and low sulphur.

Three wells in the lower zone have a total potential capacity, when clean, of approximately 300 barrels daily of 32° API oil. The four wells which are producing oil from the upper zone have a potential capacity of about 500 barrels daily. The Itaparica field has produced a total of approximately 50,000 barrels since 1942.

Several wildcat wells have been drilled within a radius of 50 miles of the city of Salvador. One of these had good showings of oil in very compact, fine-grained sandstones. It was drilled to a depth of 8300 feet. A well being drilled at the present time at a point some 47 miles north of Bahia and ten miles east of the last mentioned well showed small quantities of oil and gas on a drill stem test at 4100 feet. Drilling is continuing now at about 5000 feet.

A number of wildcat wells were drilled near the city of Maceio, state of Alagoas, some 300 miles to the northeastward of the city of Salvador. Two of these wells, one drilled on the beach and the other on a coral reef some 1250 feet offshore, encountered thick sections of depleted oil sands at depths varying from 2500 to 5000 feet. The deepest well in this area reached a total depth of approximately 7700 feet without yet having reached the crystallines.

Because of the scarcity of petroleum products in Brazil a 300-barrel topping plant was built of local material in the Aratu oil and gas field. This plant has supplied the full requirements of the drilling and geophysical operations of the Conselho and has furnished gasoline, kerosene, Diesel fuel and fuel oil to local consumers.

In 1944, with the aim of extending the program of geological exploration in the present region of operation and into other areas in Brazil and of placing such work on a sound technical basis, the Conselho Nacional do Petroleo engaged De-Golyer and MacNaughton, an American firm of consulting geologists, to direct these explorations and to advise the Conselho on technical matters related to such undertakings. Expanded geological work is now under way and reconnaissance studies have been made of the coastal region to the northward of the city of Salvador and in the Parana Basin, and it is proposed that geologists, both Brazilians and Americans, will study the various parts of the country which appear to have possibilities of production.

In recapitulation, Brazil now has approximately 25 commercial oil wells in four oil fields. Two of these fields, namely Candeias and Itaparica, have between 35 and 40 proven locations based on 25-acre spacing and may yet be considerably extended. The potential capacity of the various wells is about 2000 barrels daily. The area of proven oil production is between 1200 and 1500 acres, which area, particularly in the Candeias and Itaparica fields, is subject to considerable extension. Development of these fields continues.

There are fourteen gas wells in two fields which are capable of producing a substantial and commercial quantity of gas over a 20-year period.

The work that has been accomplished thus far in Brazil against the great adversity of wartime operating conditions and severe shortages or actual lack of materials has demonstrated the presence of commercially valuable oil in at least one region. There are other and vaster regions of possible commercial oil fields yet to be studied and drilled. The work of determining the petroleum possibilities of Brazil has scarcely been commenced, but at least the results obtained lend encouragement for the success of future petroleum exploration.

POST WAR TASKS OF MANAGEMENT

By Paul Ryan*

The author of the accompanying article has long been known as an able economist and successful administrator. As chairman of the committee established by the Petroleum Industry War Council in 1943 to study post war problems of the oil industry, he devoted special attention to the questions that have now become live issues, demanding the attention of oil company managements. World Petroleum feels that in presenting his thoughtful analysis of new factors and conditions it is rendering a real service to its readers.

PEACE at last! The wars are over! Sorrowing over our youth who were lost, we are nevertheless grateful that our sufferings were not even greater to have achieved two such complete victories over Germany and Japan.

The abrupt ending of the Japanese war, however, suddenly drops us, like an atomic bomb, into the middle of those fundamental "post-war" problems, so vital to our task of reconverting, at utmost speed, our national economy to a peace-time operation, so as to achieve maximum productivity and minimum unemployment.

Are we now better prepared for peace than we were for war? We must not "win the war and lose the peace". In the kaleidoscopic governmental aspects of our national economy, we see:

(1) Rapid changes in official positions and consolidations of over-lapping bureaus.

(2) Accelerated reconversion procedures producing much good but much confusion by conflicts between WPB "relaxations" and OPA unrealistic price-controls. Clarification should result from concentrating power, as in war-time, in one central "mobilizing" authority. Presently announced policies of higher wages, high farm prices and 1942 consumer prices have flavor of "less economics and more politics."

(3) Governmental prospects of 8,000,000 unemployed by June 1946. These cannot be absorbed if 100,000 employers are put out of business by governmental controls on higher wages, higher costs and lower prices. More thought should be given to "employers" and less to "employment".

(4) Social legislation (Murray Bill) designed to control employment, production and income. Rapacious enthusiasm of its sponsors betrays hopes that they can arrange for private business to fail in its task of adequate employment. Prewar industry never employed more than one-third of total U. S. working force of 45,000,000; industry can again handle successfully its responsibilities, if unreasonable governmental controls are removed.

(5) Delayed tax relief and probable 25 billion dollar annual budgets. Competent authorities estimate that with probable reduced industrial volume, earnings and profits to June 1946, Washington will aim to have national income increase in late 1946, and reach its peak in 1948 (both election years). Following this stimulation a "1921 slump", doubtless, will occur in 1949, and from 1950 on, prospects are bright for conducting high level prosperity.

Although broad economic problems and consideration of governmental attitudes and activities which pervade every business problem, vitally affect every industry, each particular industry has its own difficulties. Some lack customers, some lack equipment with which to satisfy consumers' demands, some lack materials, some lack workers; each industry naturally considers its own problems more serious than those of any other group. It is generally agreed, however, that the petroleum industry is fortunate in being free of many problems which beset other industries. This is a tribute to the wise management of the oil industry which, through its scientific research and development, was prepared for war and through its mass manufacturing operations, was skilled in producing unparalleled quantities of war products. Above all, this good fortune is due to the oil industry's historic independence of governmental regulation and freedom from governmental controls which caused the oil industry to invest its own money in war-created facilities to a greater extent than any other industry. Hence, the oil industry will face fewer problems in converting its facilities to peacetime uses and in the post-war disposition of governmentally-owned facilities.

The oil industry does have specific problems of its own, however; among them are the following: (1) Peak prewar production of crude oil and natural gas distillates was less than four million barrels per day. Peak wartime production of crude oil and distillates exceeds five million barrels per day. Competent authorities estimate that total demands for crude oil will not equal prewar figures until 1948. Wartime demands have caused most wells to exceed their "maximum efficient rate" of production, to which production will now be levelled. There will exist, however, excess potential production, domestic and foreign, which undoubtedly will exercise restraining influences on future inordinate price increases for crude oil.

Those of us, who were among the early advocates of a 35-cent-per-barrel price increase for crude oil,** now feel that, since the price increase was not allowed by OPA when it should have been given in 1943 to have stimulated production for 1944 and 1945, any governmental price increase, at the present time after elimination of war demands for domestic crude, might interfere with the normal workings of laws "of supply and demand" and, by temporarily stimulating increased production, adding to the postwar excess production, might impose further undue hardships on the individual producers.

"As automotive gasoline goes, so goes crude oil". In recent history automotive gasoline has been the dominant factor in volume, in sales and in profits, for the petroleum industry. Delays in manufacturing new motor cars increases "scrappage" of old cars and results in continually reduced car registration. Competent economists estimate that the total number of "cars-in-use", as of June 1946, will not greatly exceed 23 million in spite of best efforts of the automotive industry to speed new production. And that total automotive gasoline consumed by these cars, assuming maximum prewar use of other products will not require more than 3,800,000 barrels per day of crude oil during 1946, with the demand for crude oil rising to 4,000,000 barrels per day before the end of 1947.

The greatest share of wartime increased production has come from Texas, whose conservation activities, through the Texas Railroad Commission, have proven models for other states. If the Texas Railroad Commission aggressively effectuates its announced intention of preventing post-war accumulation of excess stocks of crude oil in above-ground storage, and if it asserts its authority, as it has done for the past ten years, to regulate such excess production in anticipation of preventing waste, the Texas Railroad Commission will perform a great service of conservation for the petroleum industry and for the nation.

Much war-stimulated production of crude oil has occurred above "maximum efficient rates" of production; undoubtedly, all of it has been at prices below commensurately fair and equitable price levels, compared with other war commodities. To the credit of the producing branch of the industry, however, be it stated that the oil producers did not threaten to "go on strike", as did producers in many other lines, who refused to produce their commodities unless guaranteed a "cost-plus-fixed-fee" contract, which assured these other producers and manufacturers that their selling prices to the government would cover all of their costs plus a "fixed fee" for overhead and profit. Almost alone of the great industries, the petroleum industry has carried on its activities at a price level approximately two-thirds of the general commodity index.

*Vice President The M. W. Kellogg Co.

**See World Petroleum, March 1943—"Assure Oil For Victory by Preserving Small Producers."

This patriotic cooperation of the oil industry is, in many cases, resulting in a slow liquidation of producing assets because present OPA prices are causing petroleum to be produced at price scales which do not allow replacement of present crude oil reserves because cost of obtaining new domestic production has, in many cases, increased three or four times over development cost of oil presently produced.

(2) Petroleum refining capacity is considerably in excess of estimated demand for the next several years. During this time the war-created catalytic cracking capacity alone will be able to supply almost the entire automotive gasoline demand. With reduced demand and availability of facilities for producing high-quality product, severe competition will undoubtedly accelerate an "octane race". Undoubtedly, those smaller refineries lacking catalytic cracking facilities and suffering from inland location with high transportation charges, will find economic survival most difficult as quality of gasoline and tempo of its marketing materially increase.

Prewar, refineries made money whenever profits from sale of the lighter top half of the barrel of crude oil were not eliminated by the losses from sale of heavy residual products from the bottom half of the barrel. Catalytic cracking has changed this situation; now for the first time a refiner can beneficially convert his heavy residual products into gasolines and other more profitable products. Revision therefore should be accorded those prewar basic concepts of refinery-margins, operating characteristics and overall profitability.

Rarely has the industry so rapidly advanced its technological refining improvements; never before has it provided itself with such excess facilities to produce high-quality products in ample quantities at low cost. Yet the industry possesses these developments of increasing quality and lower cost in the face of reducing consumer demand. Generally, expanding demand has been the stimulus to achieve increasing quality and lower costs.

Reduced demand and increased manufacturing facilities undoubtedly will accelerate development of procedures to reduce overall refining costs, to pack "more quality for the same dollar" into various products, to obtain greater yields of more profitable products, to convert oil refineries into "chemical plants", to increase profitable marketing operations in petroleum, chemical and other industries, and to stimulate gathering, by managements of oil companies, of broader knowledge and experience in other functions of petroleum and other industries.

(3) War-created developments of low-cost transportation by various methods will be available to effect considerable economies for the industry. Greater tonnages of new, efficient tankers and barges, new knowledge of pipeline transportation, and many new lines for crude oil and for products, will effectively combine to reduce postwar transportation costs.

Disposition of the "Big Inch" lines deserves serious consideration by the most astute minds in the petroleum industry. Some companies have developed intelligent proposals, which should be brought forward and examined in light of the most equitable solutions of these challenging problems, or else the industry will need to reconcile itself to some ultimate form of government participation. Governmental ownership or operation of these pipelines would offer most damaging threats to the foundations of free enterprise and individual initiative within the petroleum industry; any governmental bureau which had resources and facilities to purchase a half-million barrels of crude oil and refined products per day, transport them through the "Big Inch" lines, and deliver them to the eastern seaboard for distribution through various recipients of governmental benefaction, could literally dominate the petroleum industry in the United States.

Techniques and facilities for transporting crude oil and refined products by various means, have been so successfully developed during wartime that refiners, lacking benefits of these competitive transportation media, undoubtedly will be placed at severe economic disadvantage. The economic values of low-cost production and efficient low-cost refining would be lost unless the refiner possessed transportation facilities which would allow competitively low costs for transportation of crude oil and refined products.

Successful marketing of refined products in any area is predicated upon competitive costs of products delivered into that territory; those competitive costs are composed of two factors: cost of refining, and cost of transportation. The sum total of the two costs of the refined product and of its transportation must be as low as those of any competitor. The smaller refiners, therefore, who may lack some of these war-created facilities, must now look to development and utilization of transportation means which would allow competitive costs in movement of their products.

(4) Postwar distribution of petroleum products undoubtedly will undergo many changes. Advent of service station dealers into the armed services, closing of many stations, particularly the smaller, more "marginal" type located on highways or away from retail trading areas in industrial centers, total reduced gallonage due to rationing, with consequent higher operating costs, changes in consumers' buying habits, necessitated by rationing, purchase of petroleum products and services from the nearest service station, regardless of brand, service or facilities — all these factors have served to reduce the total number of service stations, to make big, well-located stations gain more customers, and to emphasize inevitable development of "one-stop" service stations located in retail trading areas.

Selling larger volumes of gasoline through fewer service stations would aid materially in reducing oil companies' costs of retail distribution. For the next several years, competent estimates indicate that total gasoline gallonage will be below prewar, while potential production of crude oil will be above prewar. The past history of the oil industry shows that under such conditions, oil companies having an excess of production, try to move their petroleum in the form of refined products, since they are unable to move it as crude oil, and thereby multiply marketing outlets, duplicate existing distribution facilities, reduce or eliminate marketing profits on their own and competitors' business, precipitate cut-price wars, create costly marketing competition, drag marketing ethics to low levels, and throw away profits on production, transportation and refining, in futile attempts to subsidize losses on marketing. Economic history of the petroleum industry shows that periods of excess production of crude oil with simultaneous reduction in consumption of petroleum products invariably have caused widespread unprofitability throughout the entire industry resulting from skilled producers and refiners becoming unskilled marketers.

Worst of all, since changes in product prices precede similar changes in prices of crude by periods of from four to six months, it is not long before downward prices of refined products cause downward prices in crude oil. Then are eliminated profits from production and transportation, which had been intended to subsidize losses from marketing. The industry rolls around in the trough of its own depression until such time as general business activity raises prices of refined products, and, four to six months later, prices of crude again turn upward.

One of the biggest problems now facing postwar operation of integrated oil companies is prevention of prewar unsound, unprofitable marketing practices. One best preventive is resolute determination by marketing executives of every integrated company to make their marketing operations "stand on their own feet", independent of any subsidies from the other functions of the business, in the same way as every independent marketer must do. If every marketing operation is made to produce its own profit, intelligent development of a company's various integrated operations can be pursued, strong equitable "competition with profit" can be maintained, legislative proposals for divorcing marketing from integrated companies can be effectively prevented, and rewards for sound profitable marketing — gallonage and profits — will go, as they should, to the most intelligent, most aggressive, and most profit-conscious marketers.

(5) The present healthy public relations attitude toward the petroleum industry seems to be the result of three factors: belated recognition on the part of the public of the splendid war-

(*Continued on page 85*)

View of Turiamo Harbor from Refinery Site.

PETROLEUM ACTIVITIES IN VENEZUELA

By Antonio Reyes

THE progress of exploration and exploitation of petroleum in Venezuela during the present year has covered a great deal of ground and at a rate which could not be calculated from past experience.

In a general way it can be said that all the foreign companies that are now working in Venezuela not only have enlarged their zones of exploration but have begun to enter upon the territories which were reserved for future development. Owing to the limited space of this article it is impossible to touch upon all the initiatives which have been started by the companies that are busy in this country. On the one hand the conversions of concessions and on the other the acquisitions of reserve zones make it difficult to give a concrete picture of present realities, and of the optimism which looks forward to the expansion of the petroleum industry during the remaining months of this year. However, from a study of one of the larger companies operating in this country — the Creole Petroleum Corporation — some idea may be obtained of the progress which is being concurrently made by other similar enterprises.

Among others, the Texas Petroleum Company has enlarged its exploration program by 20 percent in comparison with 1944. Just now, besides the exploration which it is carrying on in the eastern regions, the company is particularly interested in the Llanos region, and at a no remote date will come up with a considerable production of crude oil. It may also be said that Sinclair which already has various concessions (all within the State of Guarico), has entered the Llanos. The production of the Mene Grande district in Zulia has increased 22 percent, and the Venezuela Oil Company also shows production figures for 1945 greater than those of past years.

Among the producing wells that have recently been drilled under the new petroleum law mention may be made of one located 36 kilometers from Puerto La Cruz, State of Anzoategui. It is said that this well has a potential of many thousands of barrels, and correspondingly enlarges the reserves of Creole Petroleum Corporation.

It also appears that production in the State of Guarico, where there are several hundreds of concessions, will contribute largely to the statistics for 1945. It is now clear that this vast region of Venezuela contains great hydrocarbon riches, and in view of this, work is being pressed on the construction of roads and communications, regional sanitation, and the control of creeks and rivers to circumvent possible floods.

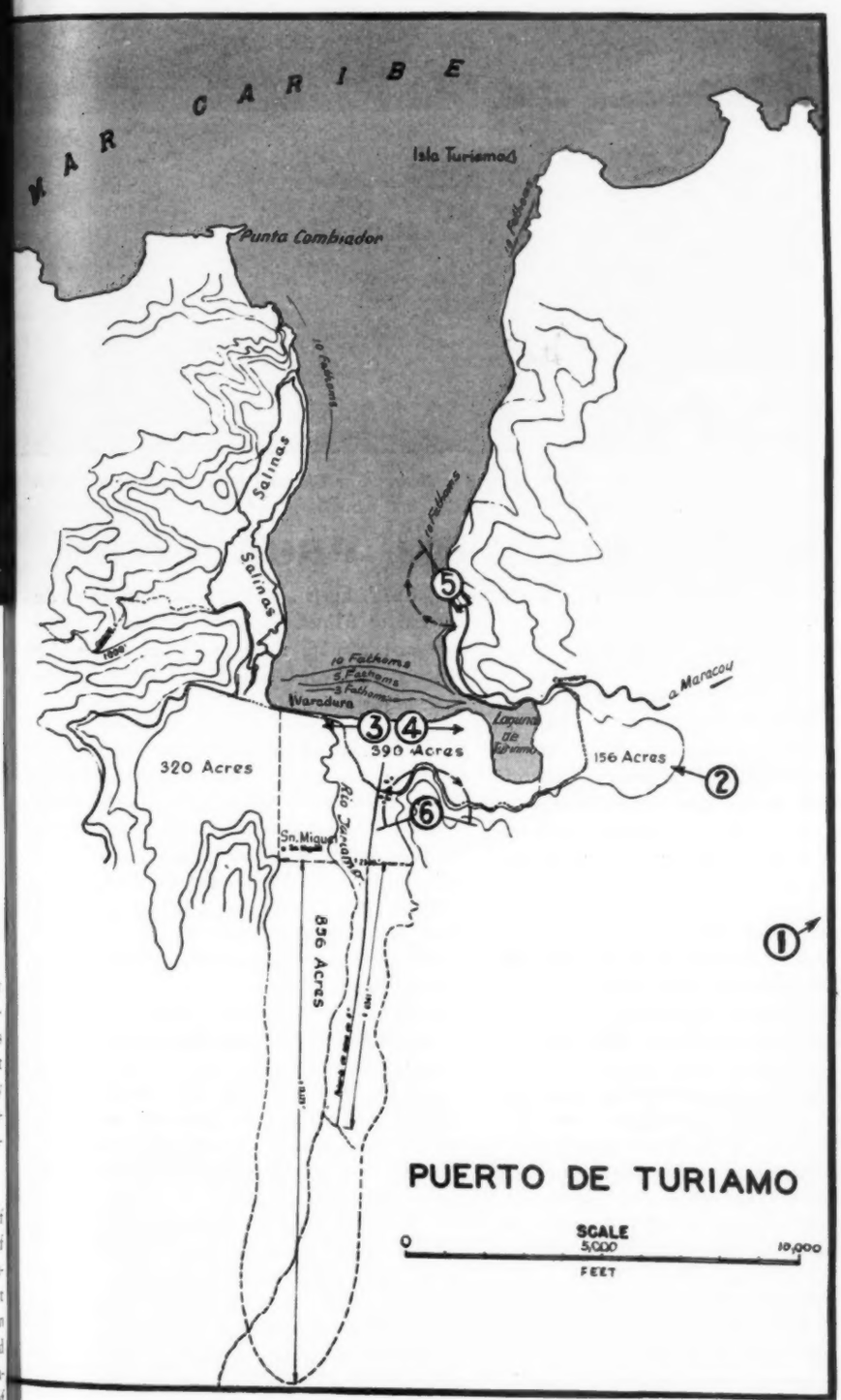
In this connection there are given below some data relating to the production of Creole for the last half of 1944 and the first half of 1945.

Field	2nd Half 1944	1st Half 1945
Bolivar (Zulia)	910,680,216 Bbls.	964,548,744 Bbls.
Cumarebo	32,461,450 "	33,400,575 "
Jusepin	36,547,410 "	44,512,030 "
Mulata	7,283,311 "	12,803,547 "
Pedernales	9,036,014 "	9,036,014 "
Quiriquire	225,826,334 "	231,416,056 "
El Roble	8,648,609 "	9,546,057 "
San Joaquin	9,929,271 "	11,829,223 "
Temblador	18,081,600 "	18,924,761 "
Other	736,864 "	736,864 "
TOTALS	1,259,231,079 "	1,336,753,851 "

This company, working under the pressure of war requirements, has increased its average daily production from Venezuelan oil fields from 393,653 barrels in December 1944 to 445,721 barrels in June 1945. Similar increases have been registered by the other companies that are operating in Venezuelan territory.

The great expansion projected for Venezuela's refining facilities was fully described in a recent issue of World Petroleum. Since that time it has been definitely decided that the new plant to be erected by Creole Petroleum will be located at Turiamo midway along the northern coastline. This refinery is to have a stipulated capacity of 40,000 barrels daily which probably will be actually raised to 50,000. The development with its model camp, health and recreational facilities, roads and terminals will cost an estimated $50,000,000. In connection with the refinery there will be erected storage tanks with a capacity of 4,000,000 barrels, along with an electric power plant and a water purification plant. Crude petroleum will be received by tanker from eastern and western fields. When completed the new development will constitute a large food consuming center which can be supplied by boats or by trucks operating over the new Puerto Cabello road.

This, together with the new Shell refinery of 40,000 barrels capacity on the Paraguana peninsula, the Sinclair and Mene Grande (Gulf) plants at Puerto la Cruz, will give Venezuela a thoroughly modernized refining industry with a daily capacity of 150,000 barrels or more which will compare favorably with similar installations anywhere else in the world.



Left: Site of Creole Refinery Showing Location of Various Stations of $50,000,000 Plant.

Bottom: Panorama from Station 5—Portion of Existing Concrete Dock at Left.

Below: View from Station 3, Looking Along Beach.

Top: Cliffs on the Naval Reserve Near Rifle Hold Unexploited Source of Oil and Gasoline.

Above: Site Chosen for Oil-Shale Demonstration Plant.

Top: Drilling Holes for Blasting to Obtain Samples for Analysis.

Above: Old Oil-Shale Workings.

STUDYING SHALE OIL PRODUCTION

AS a supplementary source of liquid fuels in case the nation's oil fields run low some time in the future, the Bureau of Mines is exploring the possiblities of tapping the big deposits of oil shale known to exist in the Rocky Mountain region. The greater part of the shale reserve is in Western Colorado, Southwestern Wyoming and Eastern Utah, and has an assay value varying from 15 to 60 gallons of crude oil per ton of shale, according to government tests.

Oil shale deposits in the country are estimated by the Bureau of Mines to contain some 92 billion barrels of recoverable oil. At the present annual consumption rate of 1.8 billion barrels of oil, this amount is enough to keep the country going for about 50 years—about four times as long as present proved petroleum reserves, according to the accepted estimate of the latter.

Under an authorization by Congress in 1944 and an initial appropriation of $5,000,000, the Bureau of Mines has selected a site for a demonstration plant to be constructed and operated at Rifle, Colorado, on Naval Oil Shale Reserve No. 1, to mine and process about 200 tons of oil shale a day. In conjunction with this there is to be a new oil shale research and development laboratory of the Bureau at the University of Wyoming at Laramie. The demonstration plant, which will not be completed before the end of 1945, is to cost around $1,500,000 and the laboratory slightly more than half a million.

Many processes have been proposed for the recovery and refining of oil from shale, as revealed by nearly a thousand patents, but in the United States none has been successful commercially and a few have been found to operate with caking shales, according to Dr. Arno C. Fieldner, Chief, Fuels and Explosives Branch of the Bureau of Mines. Special methods of extraction and refining must be devised to develop products that will be suitable for use along with those of petroleum.

Main function of the new research laboratory, therefore, will be to conduct several types of studies correlated to provide a thorough insight into the physical characteristics and chemical composition of oil shales from different states and the oil derived from them. Also, to determine the proper conditions for processing these materials and their products and by-products to yield marketable commodities as economically as possible.

Present estimates of the overall cost per barrel of producing crude shale oil in this country vary from $1.80 to $2.50, Dr. Fieldner says, explaining that these are "educated guesses at best". No commercial operations on which reliable estimates can be based have yet been conducted on American shale.

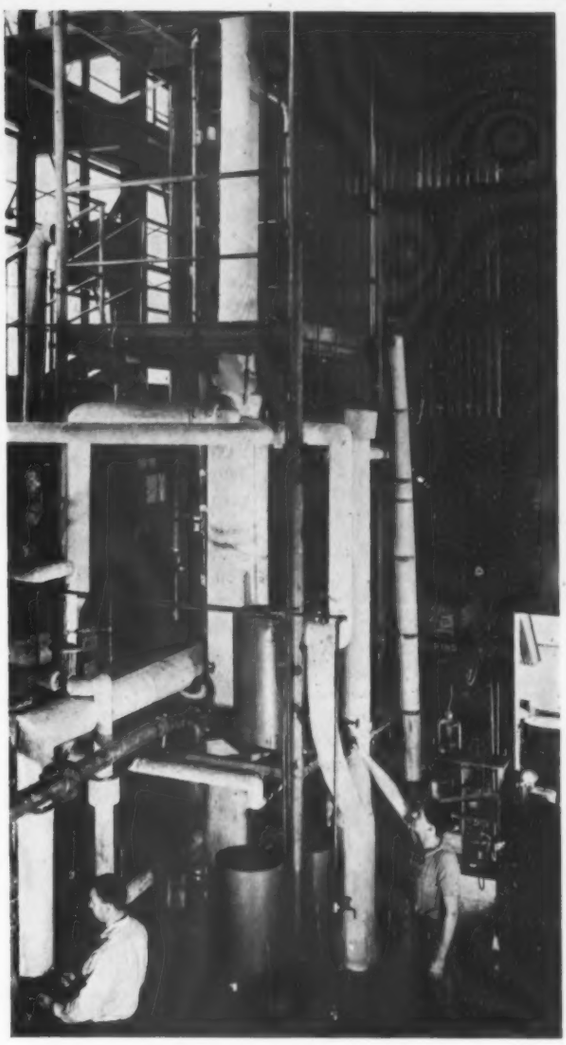
Oil shale contains organic matter. However, it is solid and the only means found so far for converting this solid material to a liquid is some form of heat. One of the research projects to be investigated is a method for heating oil shale underground to drive out the oil. The Bureau of Mines people acknowledge that obviously many difficult problems are involved in

Engineers Survey Oil Beds by Pack Train.

Right: Sampler Cuts Channel in Oil-Shale Bed.

such a procedure; for example, regulating the degree of heat, the area to be heated, and providing the necessary means for collecting and draining oil from residual rock.

The Bureau's work with shale is part of a five-year program of research and development authorized in the Synthetic Liquid Fuels Act to help provide the "know how" for private commercial production from coal, lignite, oil shale and other materials in the United States. Some $30,000,000 was authorized for the five-year plan, $5,000,000 of which has been actually appropriated to launch the program.



Pilot Plant for the Production of Oil from Shale.

NEW PROCESS OF SHALE OIL RECOVERY

A NEW method for extracting petroleum from oil shale has been developed by the Socony-Vacuum Oil Company, Inc., and placed at the disposal of the U. S. Bureau of Mines. While the extraction costs are too high for present commercial operations in competition with crude oil, the method makes available to the nation when necessary an estimated 90 billion barrels of petroleum, or nearly four times the nation's present estimated proven reserves.

Representing intensive experiments conducted at the company's Paulsboro, N. J., laboratories during the past two years, the information given by Socony-Vacuum to the Bureau includes enginering and technical data, complete descriptions of processes, blueprints and facilities for developing the 400 billion tons of oil shale, principally located in Colorado, Utah and Wyoming. The shale, now mined at the surface only, varies in oil richness.

The research conducted by the company was suggested a few years back by its President, the late John Brown, as "an anchor to windward" in view of fears then being expressed that the depletion of the crude oil would someday endanger national self-sufficiency. Development of a satisfactory method of extracting oil from shale is intended to offset this danger.

It is estimated that mining and crushing the shale probably will cost $2.20 per ton. This cost is too high for present commercial use, but would be competitive in case a shortage of natural crude should send the crude price up to $3.75 or $4.00 a barrel. In their experimental studies, Socony-Vacuum scientists recovered between 17 and 40 gallons of oil from each ton of shale, depending on operating conditions, the highest yield representing 15 per cent by weight of raw shale.

Overcoming many of the difficulties which have discouraged the recovery of oil from shale, Socony-Vacuum's method employs a retort, a vertical container, 67 feet high, which departs from conventional processes in that shale is preheated at 500 degrees Fahrenheit by the counter-current flow of hot gases which sweep the oil vapors from the retort. Consequently agglomeration and sticking of the solid material in the retort are avoided. In comparison with conventional retorting methods where the shale is heated in individual batches by external firing of metal or refractory vessels, the Socony-Vacuum method is a continuous flow and is said to be more efficient, offering excellent possibilities for reduced retort investment and maintenance.

The principle of the retorting operation consists of passing the crushed raw shale down through a tower, countercurrent to a stream of heating gases, raising the temperature of the shale to about 1000 degrees Fahrenheit. After the shale is fed to the top of the retort through a suitable feed leg, it flows by gravity. The heating gases are introduced at the bottom of the retorting zone. The oil vapors and escaping gases are taken off at the top of the retort and the oil is recovered in a series of condensers. The spent shale is withdrawn from the bottom. Low pressure steam is introduced just above the spent shale drawoff to cool it and recover heat for retoring.

Crude shale oil recovered from the retorting process is very waxy, highly unsaturated and high in sulphur and nitrogen.

Approximately 60 percent of the oil was recovered in a hot (300 degree Fahrenheit) condenser and the remaining 40 percent was recovered as an emulsion with condensed steam in a water-cooled condenser at 65 degrees Fahrenheit, the emulsion being easily broken in a centrifugal to obtain water-free oil.

★ ★ ECHOES FROM THE WASHINGTON OIL FRONT ★ ★

By W. J. Maddox, *Chief of World Petroleum Washington Bureau*

M. Cs Plan European Trip

Alfred A. Bulwinkle

NEARLY the whole House Interstate and Foreign Commerce Committee, including members of its oil investigating subcommittee, have been laying plans for a recess junket to Europe to make a comprehensive 7-weeks study of conditions there affecting petroleum and several other matters with which the group is concerned, such as newsprint. One of the questions uppermost in the minds of the legislators is how to provide the needy countries with petroleum products so they don't drain us too badly and use up our production. One member of the party says there seems to be plenty of oil in Saudi-Arabia that could be drawn on the liberated and vanquished countries.

Results of the study with recommendations for future legislation will be written into a report to be made to the House when the group returns. Inasmuch as Chairman Lea is not going, the group will be headed by Alfred L. Bulwinkle of North Carolina. Other members slated for the trip are Chapman, Ky.; Beckwith, Texas; Priest, Tenn.; Harris, Ark.; Sadowski, Mich.; Harless, Ariz.; Murphy, Pa.; Kelly, Ill.; Patrick, Ala.; Sullivan, Mo.; Rogers, Fla.; Rabin, N. Y.; Marcantonio, N. Y.; Wolverton, N. J.; Brown, Ohio; Howell, Ill.; Hall, N. Y.; and Gillette, Pa. Accompanying the group will be committee Secretary Elton Layton and House Legislative Counsel Allan H. Perley.

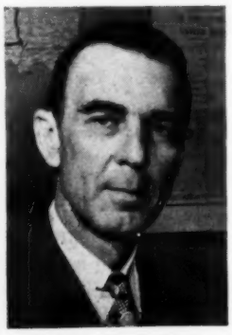
Learning From Germany

FOREIGN Economic Administrator Leo T. Crowley is optimistic over findings to date of the group of expert oil technologists now in Germany under the auspices of PAW studying refinery and oil production methods. The oil men are part of a group of 200 American technical observers operating in Europe under the direction of the Joint Chiefs of Staff in conjunction with FEA and other government agencies.

Full reports of their investigations are not yet in but when they are the data, which will become government property, will be released through government sources. FEA is now setting up the machinery for spreading the information for the benefit of American industry. The investigators themselves are prohibited from disclosing any of the information they are gathering. As an indication of what the oil industry may expect from the study, a few of the discoveries already reported to FEA are known to include: Improved techniques for the production of synthetic petroleum products; hydrogenation plants operating at extremely high pressures; new catalysts permitting the Germans to convert oil to high octane gasoline more quickly than was known here; details on German refinements in the gas synthesis method of producing liquid fuels and lubricants from coal; and new processing methods in the field of synthetic rubber.

The oil group, organized under the general direction of C. Stribling Snodgrass, Foreign Refining Director of PAW, was composed of the following technologists with Dr. W. C. Schroeder of the Bureau of Mines acting as field leader: John G. Allen, Phillips Petroleum; Harold V. Atwell, The Texas Co.; E. L. Baldeschweiler, Standard Oil Development Co.; George S. Bays, Humble Oil & Refining; Leonard E. Carlsmith, Louisiana Standard; Ernest Cotton, Gulf Oil; L. P. Evans, Socony-Vacuum; Warren F. Faragher, Houdry Process; Vladimar Haensel, Universal Oil Products; Lester L. Hirst, Bureau of Mines; William A. Horne, Gulf Research and Development; Irvin Harvey Jones, Koppers Co.; Jean P. Jones, Phillips Petroleum; Paul K. Kuhne, Gulf; Byron L. MacKusick, Pure Oil; Louis L. Newman, Bureau of Mines; William W. Odell, Bureau of Mines; A. R. Powell, Koppers Co.; Hans Schindler, Pure Oil; Guenther Von Elbe, Bureau of Mines; Ernest F. Voss, Humble; Horace M. Weir, consulting engineer; and D. S. Fraser, Chief, Technical Section, Foreign Refining Division, PAW.

PAW Production Head



Philip H. Bohart

PHILIP H. BOHART of Tulsa is the new director of PAW's Production Division, replacing John R. McWilliams who resigned August 1 to resume his duties with the Carter Oil Company at Tulsa. Bohart comes to his new duties from Gulf Oil where he was assistant to the vice president with supervision of drilling, production, warehouse and purchasing.

In handling problems of petroleum production, the new director brings to PAW 26 years' experience with the industry. He is a member of the general committee, production division, of API, and during 1944 was president of the Tulsa Chamber of Commerce.

McWilliams was appointed Director of Production for PAW in August 1944. At the time of his appointment he was vice president and manager of operations of the northwest division of the Carter Oil Company, with headquarters at Billings, Mont. Speaking of his resignation, Deputy Petroleum Administrator Ralph Davies said: "In making his services available to PAW, both Mr. McWilliams and his company have made a considerable sacrifice and an important contribution to the war program. I cannot speak too highly of his performance here."

Another returnee to the industry is Ralph J. Schiltuis, one of the few remaining members of the original staff of PAW. He has resigned as assistant director of the Production Division to return to the Humble Oil and Refining at Houston. Said Davies, "Mr. Schilthuis has served his country and the petroleum industry brilliantly and faithfully from the beginning of the critical period arising from the war."

John R. McWilliams

Schiltuis was called in July 1941 to the Office of the Petroleum Coordinator, predecessor of PAW, as second man in the Production Division. He played a major role in organizing the division, in shaping the policies and programs on production, and in successfully directing the division's work.

Possibilities in China

"ENCOURAGING possibilities" is the guarded comment of a trustworthy source here who declines to be named concerning oil exploration that has been going on undercover "at the end of the Wall" in China. The Chinese government is doing the development and no outside companies are involved. Present drilling indicates a field of maybe 100,000,000 barrels. There are no transportation facilities in the area at present for getting oil out, so prospects are that oil will not get into export trade for the time being at least. However, production of oil there will probably mean mechanization in the area, which is not now supplied with petroleum from the outside.

(*Continued from page 77*)

time job the oil industry has done; freedom from attacks during wartime by governmental bureaucrats and demagogues within and without the industry, and an intense desire for wartime unity on the part of industry executives between the industry and government and between the various branches of the industry.

Inevitable competition in politics, in government and within the petroleum industry, will cause a resurgence of attacks on the petroleum industry by self-seeking bureaucrats, by politicians who will continue to climb into office by attacking the petroleum industry, and by those operators within the petroleum industry who will not attribute their postwar failure to their own ineptitude, inexperience or lack of resources, but who will plague their governmental representatives to control "the big companies" who will be accused of putting the "small business man" out of business.

* * *

Postwar tasks for oil company management seem to divide themselves into (1) those associated with the government, (2) those which affect a company's contact with the public, and (3) those which result from the company's own internal operations.

(1) It is generally admitted throughout industry that the most successful wartime relationship between government and any industry has been that conducted by the Petroleum Industry War Council. Such success has been achieved because of the development of a sympathetic understanding of oil industry's problems by the government officials in the Petroleum Administration for War, because of the patriotic, self-sacrificing service producing unprecedented unity among all the executives of the petroleum industry, and because of competent, farsighted handling of the affairs of the Council and their relationship with the government by the chairman of the Council, William R. Boyd, Jr.

Affairs of all industry and of government undoubtedly will hereafter be more closely intertwined. This situation requires that the petroleum industry continue this present high-quality relationship between itself and government. To that end, the oil industry might well consider establishing the headquarters of the American Petroleum Institute and of the other prominent trade associations in Washington where frequent contact with government officials could be continued, and where the petroleum industry, through its various associations, would present a peace-time unity equalling its wartime unity.

It is hoped that the Petroleum Industry War Council may suffer postwar change in name only, so that it may, in the difficult days of peace, continue as that organization where all parts of the petroleum industry may meet with each other and with the government for a frank and full discussion and an equitable settlement of all those problems affecting government or the intra-industry relationships between the various parts of the industry.

Some legalistic minds preying on our twin evils of "ignorance and fear" might conjure up dire forebodings of governmental action against such a plan for industry unity in a free competitive postwar era.

The same skilful administration which has directed the Petroleum Industry War Council can undoubtedly, during peacetime, direct discussions away from those topics which might contravene existing legislation, while, at the same time, maintaining the benefits of free and open face-to-face discussions and providing for intelligent, judicial, constructive understanding of the petroleum industry's problems and activities.

Because of the inevitably increasingly close relationship between government and the petroleum industry, not only in domestic operations but in foreign operations, it is seriously urged by competent economists that no subject affecting the oil industry, transcends in importance this twin responsibility of intensifying close peace-time unity within the industry and of strengthening governmental understanding and cooperation with the industry's operations, domestic and foreign. Concentrated attention of the industry's best brains should be devoted toward achieving these two objectives; otherwise the activities of these same outstanding administrators within their own companies may be seriously handicapped.

(2) Government's attitude toward any mass-consumption industry is frequently reflection of the attitude of mass-consumers toward that particular industry. It has been proven that, although a sound individual company program is necessary to benefit each company and the industry, such programs by individual companies are not enough. It is necessary that the petroleum industry approach the public relations program as a unit, and that each company not only must conduct its own sound intelligent program, but that the industry as a whole must build a favorable public appreciation for those qualities which are, not unique with one company, but common to the industry as a whole.

This task involves not merely advertising by some trade associations; it means that the Council representing the entire industry, and every trade association and every company in the industry, must capitalize on the present favorable public attitude and must present to the public by every means possible—advertising, sales promotion, contacts with distributors, dealers and customers, corporate activities within and without the industry, etc.—that the petroleum industry and its various component companies conduct their business to promote the general benefit of the public, of their customers, of the communities in which they work and live and for the welfare of their employees, distributors and stockholders.

The third phase of management's post-war tasks concerns the internal operations of the oil company — the sphere in which management is "master of its fate". A healthy industry, however, cannot exist unless its component companies are mentally alert, financially strong and economically progressive. Pre-war oil companies handled their tasks well; changing post-war circumstances have created for them new and intensely challenging responsibilities.

Post-war problems of considerable magnitude and of tremendous importance face each oil company; only by most rigid application of proven fundamental principles of sound management in boosting productivity of its personnel and its company facilities, in reducing costs and in increasing profits, can any company be assured of continuous profitable economic existence in the tough, competitive days ahead.

Stopping rationing of gasoline and fuel oil has precipitated immediate problems of supply and distribution; after this temporary readjustment for increased civilian demand, long-term profitable solution of the industry's basic problems will require "doing" quickly and well all, and more, of each company's best accumulated post-war "planning".

Some war-created problems which challenge managements of oil companies to achieve future profits are:

(A) World-wide and domestic excess of current and potential production of crude oil remaining from war-time demand.
(B) Surplus refining capacity capable of producing greater volumes of higher-quality and lower-cost products than are currently required by consumer demand.
(C) Surplus of transportation facilities available to transport cheaply by various methods, over land and water, more crude oil and products than are currently usable.
(D) Current deficits of markets and customers, principally automotive and industrial.
(E) Distorted financial relationships between high-costs, long margins, and lush profits.

War-time emphasis was placed by government on "production regardless of cost"; this created inefficiencies, waste, callous disregard of costs, and offered handsome margins which allowed record-making profits (before and after taxes) as inducements to obtain maximum production with maximum speed. Peace-time operation by private industry must necessarily emphasize reduced costs and scrupulously eliminate waste, unproductivity and all operations which do not

definitely produce profits.

(F) War-time assumption of continuing peace-time responsibilities on plea of "charge it to taxes". Many worthy undertakings which should remain as permanent procedures may suffer post-war discontinuance, because their inauguration was based not on their fundamental merit, but on this specious philosophy resulting from war-time and governmentally-inspired naivete toward costs and taxes which has pervaded some companies and is doubtless proving difficult of removal now when proposals must demonstrate their own individual value.

(G) War-stimulated rapid technological developments enjoyed by most companies, and broad expansion into new functions by some companies, have multiplied competition for diminished post-war markets for all companies. Among integrated companies, some dominantly pre-war "producers" have expanded their refining facilities, others principally "marketers" have increased their production and refining facilities; few have not taken advantage of opportunities to have "tax-deductions" provide capital for expansion of pre-war functions and assumption of new ones. Inevitable result now is propect of fierce competition for a permanent share of presently reduced but growing markets.

(H) Rapid war-time development of industry's belated realization of the tremendous value of petroleum products as bases for chemical compounds. War caused the petroleum industry to produce many times the pre-war volume of similar compounds made by chemical industry. Possessing war-created manufacturing facilities and experience in production of large volumes of chemicals, many oil companies are attracted by pre-war long profit-margins of the chemical industry to expand into such business on chemical products, to compensate for reduced profits on petroleum products.

Unfortunately, oil companies' general inexperience in profitably marketing chemicals, combined with resolute determination of powerful resourceful chemical companies not to be dislodged from their markets, may cause oil companies to lose some of their new-found enthusiasm and some of their dollars, when invading these chemical markets, where conditions, operations and attitudes are quite different from marketing most petroleum products.

(I) Wartime dislocation of oil company's personnel. Many "key" personnel were lost to the companies during war-time, some temporarily and some permanently; their places were filled by some surprisingly capable juniors. Returning key employees must be provided for; present capable employees should also be utilized.

Fortunately, war's responsibilities, in the armed services and within any under-staffed organizations, rapidly mature junior personnel. In short periods of concentrated service, they have developed a sense of broadened responsibility, a realization of cooperation and unified action, and a competent self-confidence, based on an intelligent initiative, which would have required many more years for development under normal peace-time conditions. These rare abilities are strongly desired by modern managements who will utilize them to the fullest extent possible, consistent with sound personnel organization.

With these national and industry-wide problems confronting oil company managements, under new and different competitive post-war circumstances, competent authorities seem to agree that modern management of oil companies will desire to utilize sound proven fundamental principles of management to:

(1) KNOW thoroughly those economic conditions within and without the oil industry which impinge on the company's operations and affect its profitability.

(2) PLAN realistic programs for every function of the company, which intelligently estimate future conditions, which use every means possible to achieve utmost productivity from personnel and facilities, which vigilantly reduce costs, and enthusiastically develop profit opportunities to the fullest.

(3) KEEP FLEXIBLE to assure that those operations which would be currently most profitable are currently being conducted. This requires adequate facilities, experienced personnel for their operation and supervisory executives keenly alive to impending beneficial economic changes, but operating flexibility pays handsome profits.

(4) INTEGRATE personnel, processes and products to produce, transport, refine and market highest quality products at lowest costs. Future competitive conditions will severely limit profits on any one company function; each, therefore, must "stand on its own feet" and not expect its own losses to be defrayed by another function's profit. Close, intelligent balanced integration of all company operations will go far toward assuring each function's profitability and the company's over-all profitability.

(5) MARKET aggressively by using all means possible—personnel, advertising, sales promotion, public relations—to sell greater volumes of products, with greater productivity of personnel at lower costs, for larger profits. The war has proven that the petroleum industry can make tremendous volumes of valuable products efficiently; now it must prove that it can market these products profitably. Trained, intelligent personnel, supported by sound, aggressive marketing programs and directed by executives who can develop the fullest measure of human values, can well be combined to provide successful, productive marketing activities that will achieve low costs and high profits.

(6) DEVELOP PERSONNEL by decentralizing authority, responsibility and a broadened knowledge of the company's over-all operations, in order to TRAIN junior executives through the medium of Administrative and Operating Committees not only to use sound judgment on their own presently limited operations but to acquire experience, knowledge and broad judgment necessary to enable them ultimately to succeed the present Top-Management. Productivity of a machine is limited to its designed capacity; productivity of human beings can be multiplied many-fold by intelligent direction, stimulation and development of the personnel, the most valuable assets of the company.

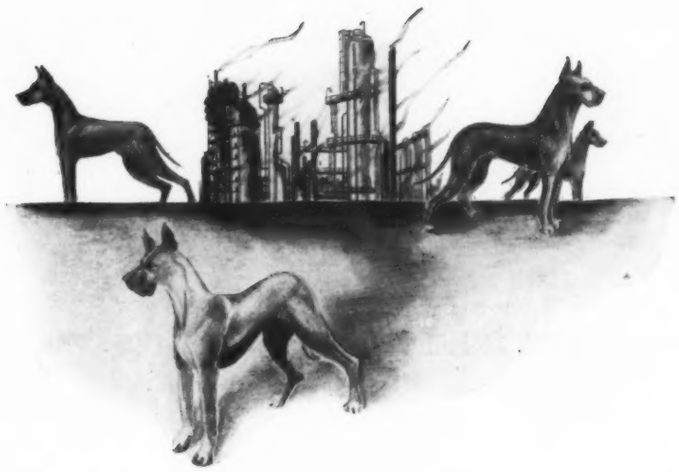
(7) BUILD GOOD-WILL among employees, dealers, distributors, customers, general public and governmental officials by soundly-conceived intelligently-administered public relations programs. War uses of propaganda for national self-preservation have conditioned most people to a healthy receptivity for intelligent public relations work; each company is financially dependent upon the strong mental conviction by employees, public and government that the company's activities are conducted in the public interest and deserve their confidence and support, without which the company would ultimately fail. Everything possible should wisely be done to create, maintain and strengthen this vital appreciation of the company — such is the responsibility of public relations programs.

(8) CONTROL all operations, before they happen, so that costs are always less than income, so that maximum productivity is obtained for every dollar of expense, and so that all dollars are directed to achieve definitely predictable profits. More than ever, severe competition now will demand exclusion of waste, prevention of losses and reasonable assurance of profits — all based on intelligent estimates of the future, on vigilant control of the present, and clinical analysis of past performances; these can best be conducted by a sound program of Budgetary Control.

(9) MAKE PROFITS by definitely identifying all sources of profit and of loss, by ruthlessly eliminating irredeemable sources of loss, by enthusiastically expanding sources of profit and by continuously emphasizing not "gallonage", but only and exclusively "gallonage with profits". Only profits maintain the company's economic existence; only profits can continue to pay wages, salaries and dividends.

10) PRESERVE UNITY of the various functions of the oil industry. Only by maintaining in peace the war-created unity of the petroleum industry can any oil company hope to preserve its own future existence. In the critical days ahead each company should assist in presenting to government and to the public a factual appearance of a unified, harmonious cooperative entity. Each company should devote its energies

(*Continued on page* 120)



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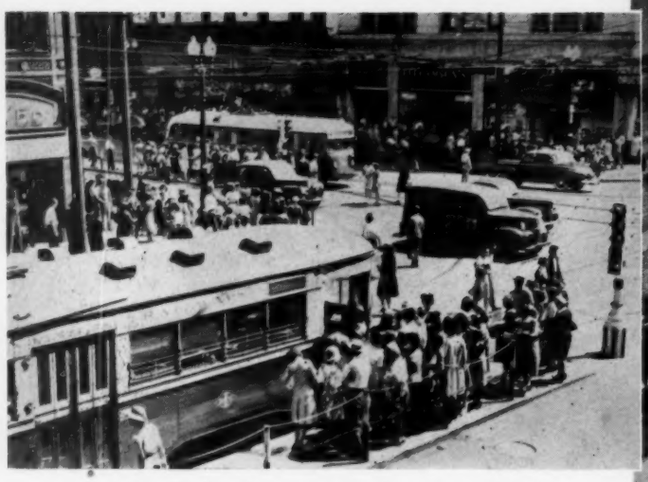

Trackless Trolley Encourages People to Start and Finish Loop Trips in Mass Transport Vehicles.

Engineers Envision More Through Traffic Arteries after the War.

MORE USE FROM CARS IN CONGESTED AREAS

By Orin Harrison

CERTAIN aspects of street and highway traffic control, designed to meet inevitable postwar needs, will have a direct affect upon the future sale of gasoline and oil. These are, first, plans which are now being made for more commodious and better planned outlying parking facilities for private cars, and, second, improvements in mass transport vehicles. There are, of course, other factors worth consideration but which are now of unknown quantity. But the rapid development of the trackless trolley coach as an auxiliary mass urban transport vehicle, has proceeded far enough to determine its effect upon gas and oil sales in the private car field.

The trackless trolley coach, in those fifty or so cities in which it has been the subject of experiment, is not looked upon as a substitute for the street car or the motor bus. It has been found, however, that on certain urban routes and under certain conditions, it is superior to either in numerous ways. And though the increase of trolley coaches might appear as a deterrent to gas and oil sales, the trolley coach as a factor in postwar transit generally will vastly offset any such deterrent by the widening of markets through the services it renders.

In a nut-shell, it has been found in many sections where the trolley coach is being widely used, that the mileage run up by private cars actually increases. All this is tied in with the basic principle of postwar traffic regulation: first, encouraging more car owners to drive to conveniently located perimeter lots, finishing trips by mass transport vehicle; second, encouraging car owners to have other members of the family drive them to trolley, bus or street car, finishing the trip therein.

In any case, millions of car owners who in peacetime normally drive their cars to the heart of the city and park them there all day will in this way leave the car home for the family to use, thereby increasing mileage and gas and oil consumption.

The trackless trolley coach offers certain advantages which will encourage the car owner to leave his car at home or at the outlying parking lot, then finish and later begin his trip to and from the office and home. Incidentally, an owner who normally leaves his car at home in the garage and takes a street car, bus or trolley coach to the "loop" is a smaller consumer of gas and oil than the one who makes only part of the trip by mass vehicle.

Advantages of the trolley coach as it favors the car owner and encourages him or her to use the vehicle for a part of each trip may be summarized as follows: (1) greater speed—faster on pickup and stop; (2) greater safety—more easily controlled in traffic; (3) fewer jolts and jerks; (4) holds place in traffic line. Among the advantages to the car owner as driver are: (1) loads and unloads at curb; (2) can by-pass slower traffic; (3) can by-pass obstacles by rerouting; (4) is odorless.

There is, of course, a direct relationship between increased ratio of speed of the traffic flow and the consumption of gas and oil. There is a relationship between the consumption rate of gas and oil and factors which tend to keep more cars rolling more of the time, and especially more of the time when normally family cars are idle in garages. In this connection, the oil companies will find their interests served in the objectives of postwar traffic control in a recent report of the Eno Foundation for Highway Traffic Control, which goes on to point out that these objectives are: (1) more vehicle miles of highway travel; (2) increased emphasis upon the time values of travel; (3) more rapid and less interrupted flow of travel; (4) more convenient parking; (5) through roads and streets for through traffic (arterial type); (6) reduction in conflict between commercial and non-commercial traffic.

Before the war the average speed of vehicular traffic in congested urban areas was three miles per hour. While a normal city street can carry 3,700 passengers an hour riding in private autos alone, with private autos and trackless trollevs street cars or buses, 15,000 can be carried in the same period of time on the same street footage.

The oil companies must recognize as a private car market factor that congested areas are on the increase, and that they are certain to affect the sale of oil and gas in that great field—the private car group. Says C. W. Gifford, president, Des Moines Railway Co., and an outstanding expert: "Throughout the midwest, due to population characteristics, great distances, the convenience of the automobile, and the desire of country people to come to town there has developed in almost every city a centralized highly concentrated retail trade or "loop" shopping district. In Des Moines, as an illustration, a community of about 165,000 people, this condition has produced a trade area that places that city, although fifty-sixth in population, seventeenth as a market in the United States according to Standard Rate and Data Service."

It is in such sections as those that the markets for gas and oil are likely to increase most rapidly once the nation's normal number of private cars is back on the streets. Yet, it is also in these localities and under these conditions that the trolley coach promises not only to increase private car mileage but also to expand sales as a result of the more rapid consumption of oil and gas in a faster and more efficient traffic flow.

From the viewpoint of over-all consumption and regardless of the new types of motors which may increase mileage after the war, the present post-war plans for improved traffic management and control would seem to greatly favor an increase in the consumption of fuel and lubricants. And this at a time when the industry will be seeking new markets and new ways to build up the old ones.

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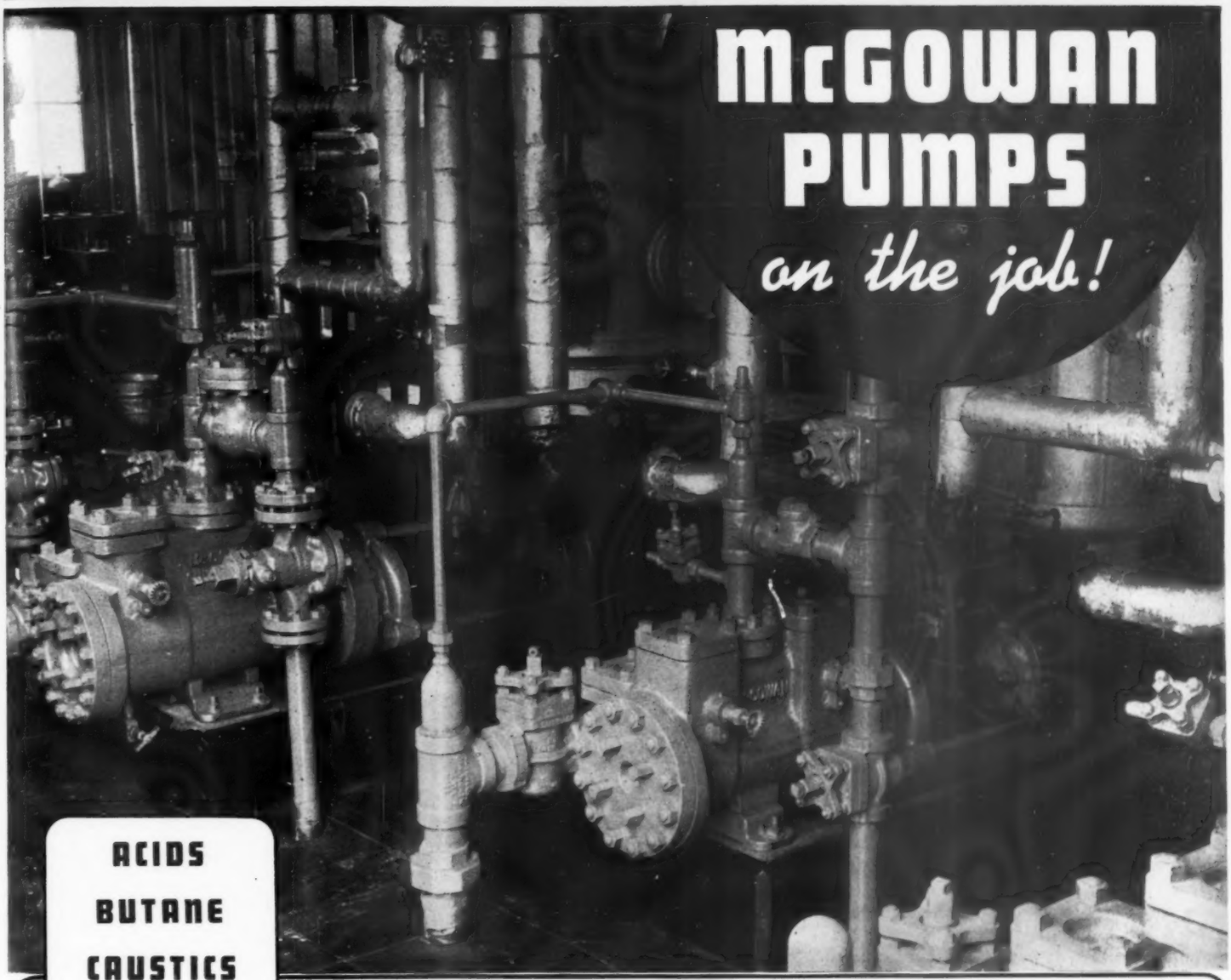

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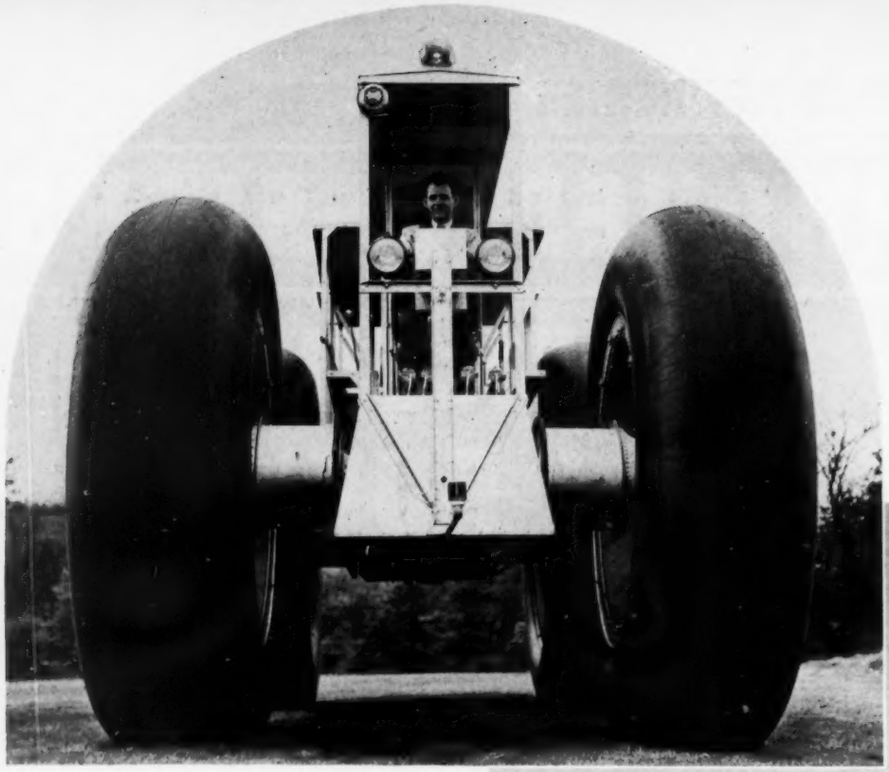
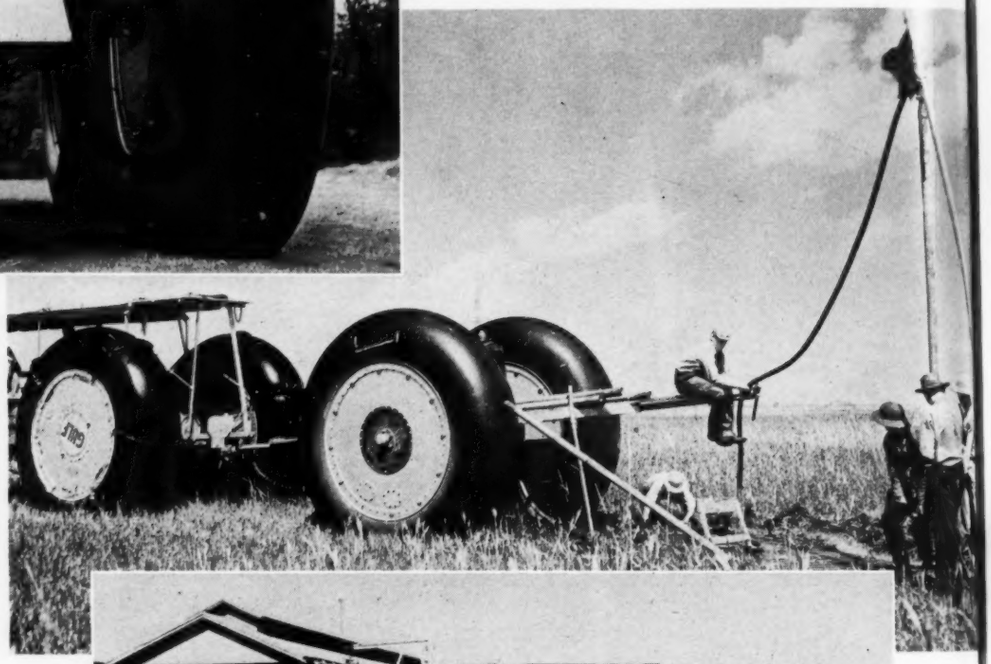
MARSH BUGGIES HUNT OIL IN SWAMP LANDS



Left: This Strange Monster is a Marsh Buggy Built for Use of Gulf Oil Corporation in the Search for New Oil Fields in Central America.

Below: Two-wheel Trailer in Foreground is Equipped with 120-inch Goodyear Tires. Wooden Platforms are Laid Down to Keep Men Afoot.



Triangular- shaped Segments of Rubber Strung on Steel Cables are Mounted Transversely Across Surface of Tire, Providing Traction in Mud and Acting as Paddles in Deep Water.

TIRES four feet taller than the height of an average man which will equip an amphibious vehicle for oil explorations in Central America and the southern United States have recently been completed by the Goodyear Tire and Rubber Company. They are 10 feet in diameter and will be used for a new marsh buggy of the Gulf Research and Development Company in Nicaragua. Also included in the shipment were replacement tires for two other Gulf marsh buggies operating in the swamplands of Louisiana, Texas and Florida.

These tires are similar to the ones made by Goodyear in 1936 for Gulf's original marsh buggy which was one of the first successful amphibious vehicles. A year later tires were produced for a second vehicle. Two-wheel trailers for the two old buggies and the new one are equipped with similar tires. They are the tallest tires ever made. Each one is 66 inches in diameter; each weighs 315 pounds and contains an inner tube weighing 125 pounds. Goodyear also makes the wheels on which the tires are mounted. These wheels are hollow, air-tight aluminum drums, providing added buoyancy.

The first two Gulf marsh buggies have traveled many thousands of miles in swamps and marshlands and have been instrumental in opening several new oil fields. The original tires and tubes, according to Dr. E. A. Eckhardt, Gulf vice president in charge of geophysical research, "have lasted far beyond expectations".

The marsh buggies are used to transport geophysical equipment and personnel in the marshes encountered in the Gulf coast area. Due to flotation provided by the drums and tires, the marsh buggy navigates streams and lakes of any depth. It also operates equally well on dry land and will traverse marsh which neither a land nor conventional water unit can cross. Maximum speed in water is about four miles per hour. On land the buggy can travel in excess of 20 miles per hour.

The four wheels of the marsh buggy are power driven with chains linking the two front wheels to the two rears. Tires are made without non-skid tread design, but triangular-shaped segments of rubber are strung on steel cables and mounted transversely across the surface of the tire, providing the necessary traction in mud, and acting as paddles in deep water.

Tires may be inflated while the buggy is in operation. A blower powered by the vehicle's engine is used to provide the compressed air. Thus, if a tire should be punctured while on a field trip, it would be possible to continue to pump air into the tube en route to the base of operations where repairs could be made. Three to four pounds of pressure is normal inflation.

Overall width of 11.8 feet for the marsh buggy prohibits use on the highways. The buggy is 24 feet in length and between 12 and 13 feet high. Each marsh buggy weighs about 7,500 pounds. Carrying capacity is from 1,000 to 1,500 pounds.

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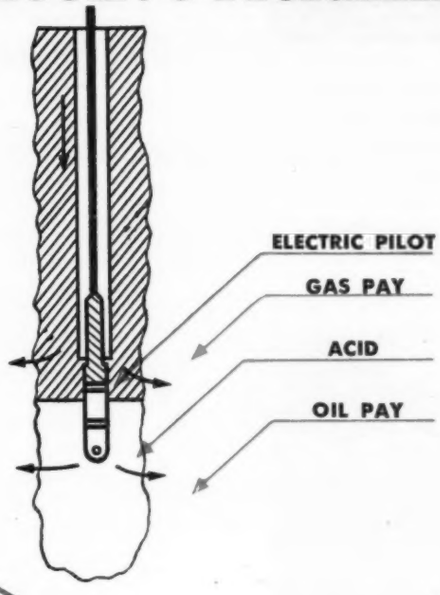

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Mexico Develops New Oil Fields

PEMEX has further intensified its exploration works with the operation of more than 30 brigades of geologists, fully equipped with the latest apparatus for their work, in the northern section of the U. S. border states of Tamaulipas, Neuvo Leon and Chihuahua; the Tampico zone, the Isthmus of Tehuantepec sector, and regions of Vera Cruz, Tabasco, Chiapas, Oaxaca, Guerrero, and Puebla states, and the northern and southern Districts of Baja California.

Preliminary works are now in progress for the development of a prospective oil deposit that was discovered last summer in Guerrero. These works consist of road surveying, transporting equipment and installing labor camps. Test wells are soon to be drilled. Pemex reports that nearly 500,000 hectares (1,125,000 acres) of lands, with promising signs of oil, have been located in Baja California. A gas well is being drilled in the Matamoros zone, Tamaulipas (across from Brownsville, Texas), and two more are to be drilled soon, which, by the end of this year will give six of these wells in that region. Well drilling is progressing between Minatitlan and Coatzacoalcos, Vera Cruz, a zone of high grade crude.

Pemex hopes that these works will considerably increase its production by the end of this year, as several wells that have been brought in have been treated to up their output. Exports of oil and its products are counted upon to be substantially augmented before 1945 is out, as Sweden and other European countries are negotiating with the Mexican economic commission now visiting the old world for large quantities of these products.

Another step toward providing geographically isolated but important zones on the United States border with oil and its products on an ample and sustained basis has been taken by Pemex with the establishment of a large storage plant at Punta Prieta, southern district of Baja California. The plant cost 1,500,000 pesos. Its capacity is 550,000 liters of gasoline, 370,000 liters of tractomex, 390,000 liters of Diesel combustile and 740,000 liters of general combustible.

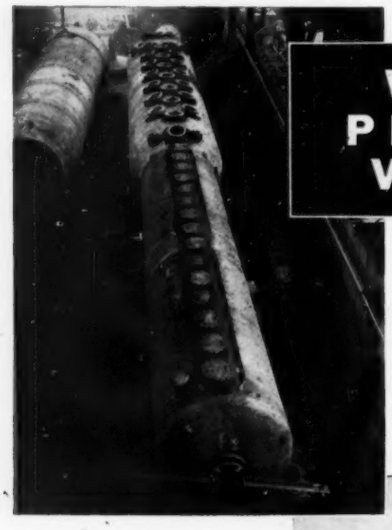
The plant is being serviced by sea tankers from Salina Cruz, Oaxaca, principal port of southwestern Mexico, to which oil and its products are moved overland by the Tehuantepec National Railway, which crosses the Isthmus of Tehuantepec from Coatzcoalcos, center of the Gulf oil fields.

Pemex is now constructing similar storage plants in Brownsville, Texas, over the border from Matamoros, Tamaulipas, Salina Cruz, Campeche City and Acapulco.

In announcing the opening of the Punta Prieta storage plant, Efrain Buenrostro, the Pemex general manager, said: "Pemex has assured a brilliant future for Baja California."

Pemex announced that it expects deliveries of machinery and equipment from the United States for its program of reconditioning refineries and expanding pipelines, now much advanced, to be sustained at the rate of about 200 carloads monthly. It added that it has sent 23 engineers and other technicians, specially selected from its staff, to the United States to become versed in the various processes of refining that will be used for the first time in Mexico at the refinery at Atzcapotzalco, D.F. Mexico City suburb, which it is enlarging and improving and expects to have ready for its first tests in December.

The company announces that it will be able to carry through its program for the drilling of 62 oil wells this year. It drilled 52 in 1944.



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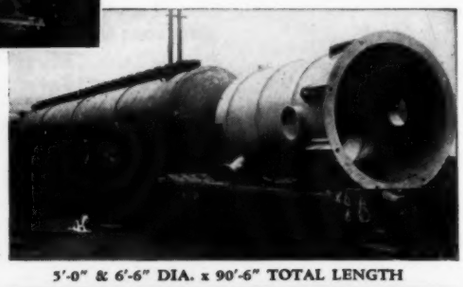

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Schlendorf Heads Republic Sales

THE election of N. J. Clarke as senior vice president and J. M. Schlendorf, vice president in charge of sales, of Republic Steel Corporation has been announced by T. M. Girdler, board chairman, and C. M. White, president. Mr. Clark has been vice president in charge of sales for Republic since September, 1930, shortly after the corporation was formed, and will be succeeded in that position by Mr. Schlendorf who has been assistant vice president in charge of sales.

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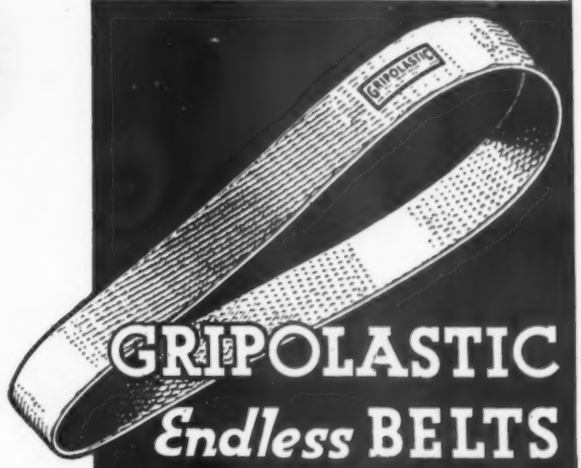

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(*Continued from page 86*)

to maintaining that unity within the petroleum industry, without which each oil company would suffer dire consequences. The war has united the oil industry as it has never been united before; in such unity is strength, progress, leadership and prosperity.

The oil industry is considered fortunate by managements of companies in other industries. Oil's post-war readjustments do not involve changing manufacturing facilities from producing goods which have war-time usage only; these readjustments do not involve closing down huge factories and the release of thousands of personnel. Petroleum's primary readjustments involve reduction of operations from high levels of production, involve psychological changes from selling principal products to only one customer — the government —; they involve temporary reduction of long war-time profits resulting from manufacturing unprecedented volumes of petroleum products for war; they involve the recreation of competitive forces in the marketing of their products. In short, the post-war readjustments for the petroleum industry are primarily not in facilities nor in products but in the attitudes and controls of management.

Such conditions clearly indicate that no oil company can, in these difficult days ahead, consider itself independent of the entire petroleum industry. Each company's economic existence must depend upon the others in the industry; the industry must retain that war-time unity which has so dominantly characterized its war-time operations. Only by presenting to the government and to the public a unified, harmonious appearance and by acting cooperatively on public questions, can the oil industry protect itself from those destructive characterizations of "big business" which will result when the inevitable aftermath of war produces "fewer, bigger, and better industrial units".

Only by Managements of oil companies accepting the responsibility to conduct their operations in conformity with the public interest and avoiding censure from the governmental authorities or the general public can the oil industry's activities be coordinated for the maximum, mutual benefit of all the companies, their customers and the public.

It is undoubted that for the next several years the chaos and confusion, surrounding the task of replacing the collossal volume of wealth destroyed by war, will multiply the problems of management. The petroleum industry, however, can take strength from its past proud record in which it has conquered physical obstacles, has caused Nature to do its bidding, has dug from the hidden recesses of the earth this vital resource so necessary to civilization, has transported petroleum over mountains and under rivers, and has established the most enviable record of accomplishment in war-time, by producing unheard-of volumes of undreamed-of products to achieve victory for the United Nations.

Now, oil company Managements face their biggest task — the control not of physical facilities, nor of Nature, but the control of their own managerial operations. Paraphrasing the motto "Know Thyself" on the Parthenon at Athens, the biggest post-war task of any oil company Management is to "Control Itself", so that it will regulate its operation to continue in peace its war-time leadership, and to maintain, in the prosperous years ahead, the American oil industry as a prosperous and profitable industrial entity rendering increased service to mankind.

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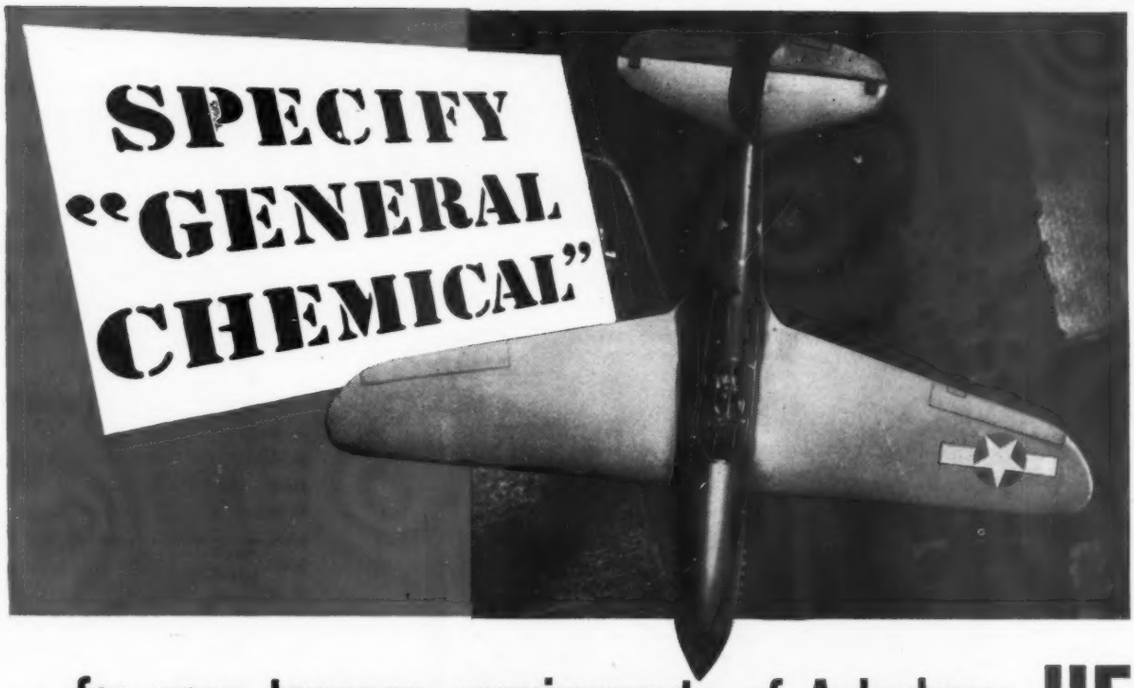

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Fuels for Future Plane Use

JET planes, even with their ability to use heavy fuels, will probably not come into ordinary use for private or commercial use for a long time, if ever. This is the conclusion reached by the research department of the Standard Oil Company (Indiana) as the result of a survey of expert opinion recently completed. The survey was part of the company's study of future fuels and requirements, and dealt entirely with civil aircraft.

A jet plane must fly high and fast. Since high-altitude, high-speed flight is expensive no matter what kind of engine is used, the experts feel that jet planes will hardly fit into the economic picture. For a number of reasons, including fuel economy, most commercial flying will be at speeds less than 300 miles an hour and at altitudes below 20,000 feet. Although the fuel burned by jets may be slightly cheaper than gasoline, this disadvantage cannot offset the greatly increased fuel consumption of the jet-type power plant. In addition, jets are apparently going to be much more critical of their diet than was at first supposed.

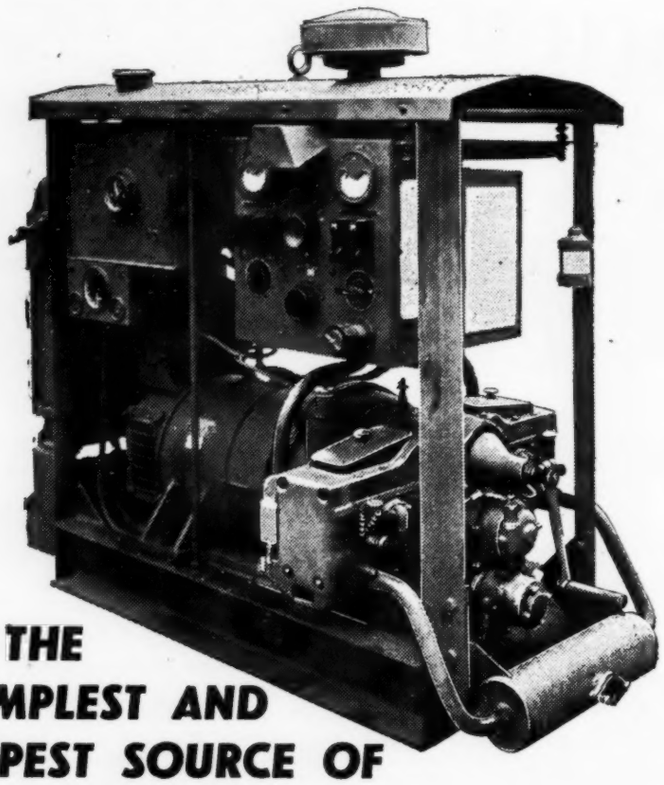
However, the piston engine is due to lose much of its present superiority, the survey revealed. Most experts feel that the large airplane of tomorrow will use propellers, but that the propellers will be driven by gas turbines. These turbines may be held back for a time by the fact that they use more fuel than the highly-perfected modern piston engine, but their advantages should eventually enable them to supplant present engines. Perhaps the two may be used in combination.

Among the advantages of gas turbine engines, it was pointed out that they offer fewer design problems — particularly in large sizes— and they are simpler to operate and maintain. Whereas piston engines become increasingly complex as size goes up, turbines ought to be actually easier to build in the very large sizes than in small sizes. Smoothness of the turbine operation will be another great advantage both to the plane designer and to the passenger.

First planes to use the turbines will probably be those flying less than 1,000 miles, where the extra fuel will not be a burden. As more heat-resistant materials are developed for turbine blades, and as efficiency therefore goes up, the turbines will be used more widely—particularly as planes are built that need engines of greater than 3,000 horsepower.

Kessler Visits United States

J. B. AUG. KESSLER, of London, Joint Managing Director of the Royal Dutch Shell Group, is on an extended trip to the United States which will take him to the Pacific Coast and back before his return to England.



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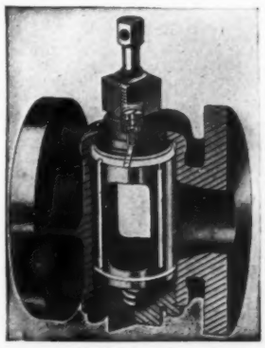

★ This sectioned illustration of a flanged Newman - Milliken Valve shows the cylindrical plug and lubricant ducts which seal the valve against leakage and ensure easy operation at all times. A rectangular port valve is shown, but full round port valves are also manufactured.

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Oil Company Staff Changes

IT has just been announced that J. H. Loudon has been elected president of the Caribbean Petroleum Company, an associate within the Royal-Dutch Shell Group and one of the larger oil producing companies in Venezuela. At the same time, the election of H. Wilkinson as chairman of the board was announced by the directors of the company. Both of these officials have had long experience with the Royal-Dutch Shell Group interests, both here and abroad.

Mr. Loudon, a native of the Netherlands, joined the Royal-Dutch Shell Group at the Hague in 1930, following his graduation from the University of Utrecht as a Doctor of Laws. After short service in the Hague, he spent five years in the United States, first with the Shell Oil Company in the east and then with the Shell Oil Company of California. In 1936, he went to Venezuela as assistant manager of the Caribbean Petroleum Company, serving under B. Th. W. van Hasselt. In August, 1944, van Hasselt was elected a managing director of the Royal-Dutch Shell Group, with headquarters in London, and Mr. Loudon replaced Mr. van Hasselt at that time as general manager of the Caribbean Petroleum Company.

Mr. Wilkinson, who has recently been released from his war duties in Washington as the British government's petroleum representative in the United States, returns to the Caribbean Petroleum Company as a director and chairman of the Board. Born in Burma, Mr. Wilkinson joined the Royal-Dutch Shell Group in 1922; after various short periods of service in London, the Straits Settlements, Malaya and again London, he was assigned to South Africa where, in 1930, he was appointed manager of Shell interests there. His experience in the United States began with his election in 1932 to the vice presidency of Asiatic Petroleum Corporation; in 1936, he was elected President of Asiatic and of the Caribbean Petroleum Company. Following Pearl Harbor and the entrance of the United States into the war, Mr. Wilkinson served in Washington as British petroleum representative, until June of this year. During his absence F. J. Hopwood, who has now returned to London, served as president of Caribbean and Asiatic. Mr. Wilkinson now returns to Shell Group service as president of Asiatic Petroleum Corporation and as chairman of the board of the Caribbean Petroleum Company.

RETIREMENT of Wallace E. Pratt from the directorate and executive committee of Standard Oil Company (New Jersey), was announced August 1 by Ralph W. Gallagher, chairman of the board. Mr. Pratt resigned a few months since as vice president of the company and the present step marks the final severance of his active connection with the industry in which he has had an exceptionally distinguished career.

THOMAS W. PALMER, Standard Oil Company (New Jersey) attorney, has been honored with the highest decoration of the Venezuelan government for his contribution in promoting better relations between that country and the United States.

Mr. Palmer was awarded the Order of the Liberator with the rank of commander, highest grade granted a non-official civilian, by President Isaias Medina. Presentation of the medal and citation will be made through the Venezuelan Embassy in Washington.

As head of Jersey's Standard's Latin-American legal staff, Mr. Palmer has spent many years in South American countries and has taken an active part in fostering understanding among the Americas. In 1936 he was decorated by the Brazilian government with the Order of the Southern Cross for similiar activities. President for three years of the Venezuelan Chamber of Commerce of the United States, he is former vice president of the Pan-American Society and is a founder member of the New York Chapter, Bolivarian Society.

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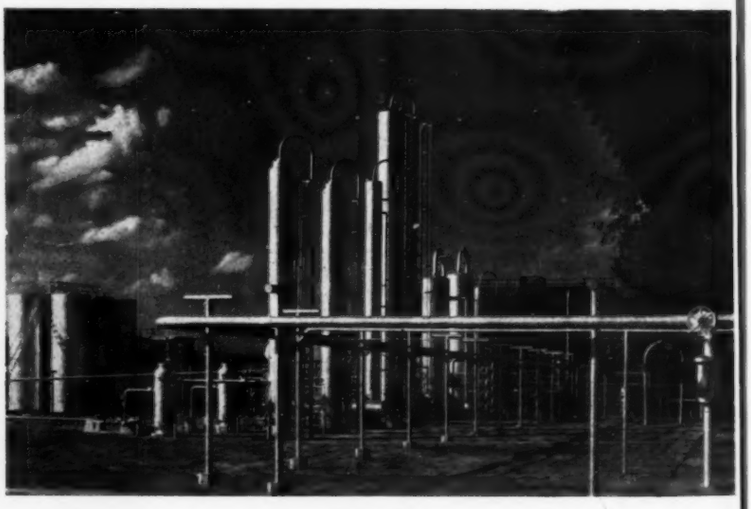
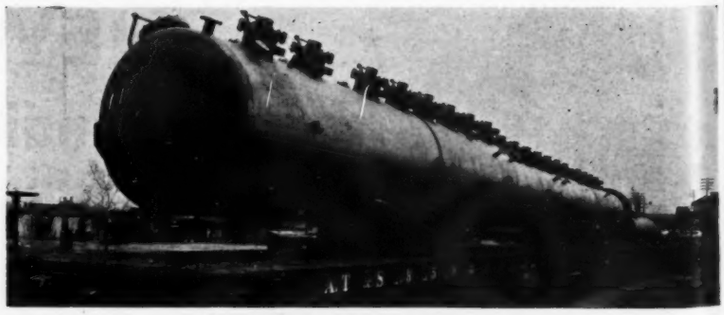


Recycling Plant



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World's Oil Position

(*Continued from page* 53)

Geared to an oil economy the expanding and increasingly industrialized world will be more avid than ever for petroleum. The United States has proved that a nation with ample oil supplies at reasonable cost achieves a higher standard of living.

There are, of course, myriad other world problems concerning refining and marketing. However, these cannot be solved until world production is handled in orderly fashion.

The background of facts and conclusions indicate that unless the oil industry tackles its problems on a world basis there may be untold conflict and confusion between the great and small powers. Obviously, America must reach an accord with Great Britain and Russia on world oil policy. To be effective, this policy must take into consideration equitable production from the earth's oil areas under non-discriminatory conditions which will be beneficial and satisfactory to the owners of resources as well as to those who control and produce them.

The governments concerned are aware of the dangers ahead. In August, 1944, the first draft of an Anglo-American oil treaty was prepared to lay the groundwork for multilateral oil treaties with the principal producing and consuming countries of the world. But the problem has hit one snag after another. There has been opposition within government and industry.

Secretary Ickes, who has been the most ardent champion of world oil accord, maintains that with more cooperation from both sides he would have had the first treaty signed a year ago and the rest of the problems well on to solution. It has been expected that he would go to London to renegotiate the treaty.

As it is, the end of the war is here with many urgent problems. The State Department is involved with matters of more immediate pressure and no important executive of the State Department has claimed the oil problem as his particular project. The change of British administration will make it necessary to re-explore British policy. Russia is silent. Trouble is fomenting in the Middle East. South America is faced with an immediate slump in its oil income which cannot be expected to improve its oil policies.

The oil industry is faced with the headaches and hardships of reconversion and the guideposts of world policy have not yet been erected.

The industry itself is most vitally concerned as its future is dependent upon orderly conduct of the world's oil business. Consequently, it seems that the impetus for petroleum planning for peace must now come from industry.

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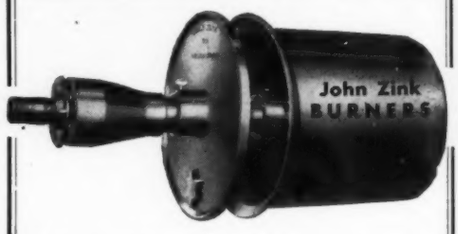

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The **YORKSHIRE COPPER WORKS** LIMITED LEEDS

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40-RANGE *Universal* AVOMETER

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ELECTRICAL MEASURING INSTRUMENT

A SELF-CONTAINED combination A.C./D.C. meter of B.S. 1st Grade accuracy, the Model 40 Universal Avo-Meter provides for an exceptionally wide range of measurements. Every essential electrical test on the bench, or out on a job can be carried out simply, speedily and with unfailing accuracy. An automatic protective cut-out is incorporated in place of the conventional replaceable fuse.

ONE INSTRUMENT measures:—

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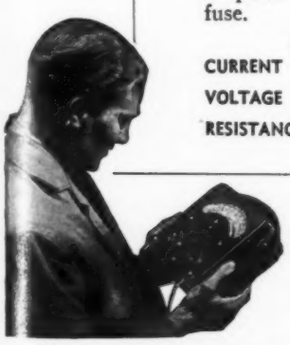

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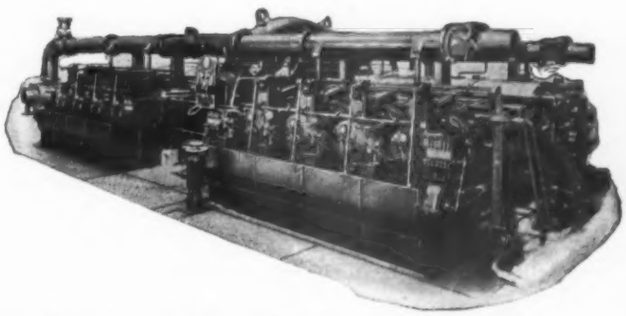

A 2,600 B.H.P. Crossley-Premier pressure-charged 16 cylinder oil engine Convertible to work on Blast Furnace Gas

This engine, the largest horizontal Oil Engine working in this country, is installed in one of several large works of a steel firm in the Midlands having twenty Crossley-Premier engines in use. At present running on oil, it is designed to operate also on Blast Furnace Gas.
Present running conditions are particularly arduous, involving non-stop working from Monday morning until Saturday noon under heavy load. The Crossley-Premier engine is specially designed for such heavy duty, its slow speed and exceptionally robust construction ensure continuous and reliable performance.

CROSSLEY-PREMIER OIL ENGINES & GAS ENGINES

SIZES up to 3,000 B.H.P.

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P.65

When You Rent The E-C Inclinometer

Our rental customers receive the E-C Inclinometer in this compact carrying case. They are assured of the security and accessibility of the contents.

The E-C Inclinometer is made of K-Monel Metal, which is the highest possible grade material and lends itself to great accuracy in fabrication. The carrying case also is of K-Monel Metal sheets and N. P. brass.

SPERRY-SUN WELL SURVEYING CO.
1608 WALNUT ST., PHILA. 3, PA.

Burmah Oil Company Plans Resumption

REITERATING that the road back to production in Burma must be long and difficult, the chairman of the Burmah Oil Co., Ltd. Robert I. Watson, told shareholders in Glasgow that, for that reason, the directors had resisted the temptation to make a larger dividend. Faced with a long and difficult process of reorganization, the company is now dependent entirely on the volume of purchased oils for which it can find a market and on the margin between the coast and the value of that oil to the company. Because of this dependence, Mr. Watson stated, the board is following a policy of financial caution.

Prior to the time when Burma was overrun by the Japanese it was producing about a million tons of crude oil annually. This met Burmese requirements and left a surplus to satisfy the greater part of India's needs, quite 50 per cent of the Indian supplies at the outbreak of war coming from Burma. The value of the industry indirectly, apart from the provision of oil, was considerable in that it gave rail, stores, road, engineering and contracting work over a wide area of Burma. The denial of the Burma oilfields to the enemy in accordance with military instructions was so effective that the Japanese obtained little oil from that source.

The revival and reorganization of the industry in Burma will be possible but its cost will be heavy. A prewar assessment of the physical assets of the industry was in the region of 40 million. But the cost of replacement would be very much greater. That is a burden which neither Burma nor the company should be expected to assume under the circumstances. The industry's rehabilitation is an important step toward restoration of Burma's economic life. Moreover, whatever the immediate relation of the world resources of petroleum to world requirements it is not imaginable that Burma's resources will not be preserved and utilized.

While the company is anxious to rebuild the installations that have been destroyed and thus help to restore the country's economy as quickly as possible, its directors have nothing more to go on in respect of such war losses than the government's existing declarations. These are indefinite and afford no security to those who might be prepared temporarily to finance themselves. The company states that its plans for restoration are well advanced but that full rehabilitation cannot be undertaken until there is definite acceptance of governmental responsibility for the costs involved.

The chairman's report referred to recent strikes in the Punjab by the Attock Oil Co., Ltd. on ground continguous with Burmah Oil Co. concessions, and stated that active steps were being taken to test this area. In view of holdings of both companies being on the same geological strata it mentioned that unit development, already agreed upon in principle, would seem to be in the best interests of all concerned.

Industry To Get German Oil Secrets

GERMAN oil processing technology will be made available to the American oil industry as rapidly as possible by the Petroleum Industry Oil Council at the request of the Petroleum Administration for War. Actual work of translating and abstracting the data gathered by the U. S. Government Technical Oil Mission is to be done under the supervision of the Technical Advisory Committee, a subcommittee of PIWC's Technical Committee.

A number of teams, possibly 15 or 20, will be organized to speed the work, it was announced by William R. Boyd, Jr., chairman of PIWC. This is essential because more than 100,000 microfilms have been made by the oil mission. Each team will consist of a translator familiar with German technology and a group of experts in the particular process covered by the film.

A composite report will be prepared by a correlation committee. This group will include as many members as possible of the original mission which gathered the German oil secrets.

Succeeds Stettinius on M.I.T. Board

HARRY C. WIESS, president of the Humble Oil & Refining Company, has been elected to special term membership on the corporation of the Massachusetts Institute of Technology. He succeeds former Secretary of State Edward R. Stettinius Jr., whose term expires this year.

Wiess is a trustee of Rice Institute and also of Kinkaid school in Houston. He is a member of the Petroleum Industry War Council.

OIL DISTRIBUTION

The Great Western Railway Company's South Wales Docks at CARDIFF, SWANSEA, NEWPORT, BARRY, PORT TALBOT and PENARTH (Harbour) are excellent terminals for oil distribution.

OIL TANKERS AT G.W.R. DOCKS

SITES FOR NEW DEPOTS ARE AVAILABLE

For information apply to the respective Dock Managers or to :—

LESLIE E. FORD,
Chief Docks Manager,
Great Western Railway,
CARDIFF

JAMES MILNE, *General Manager.*
Paddington Stn. London, W.2

#3 in a series of advertisements discussing postwar refining processes.

NAPHTHA REFORMING FOR POSTWAR COMPETITIVE MARKETS

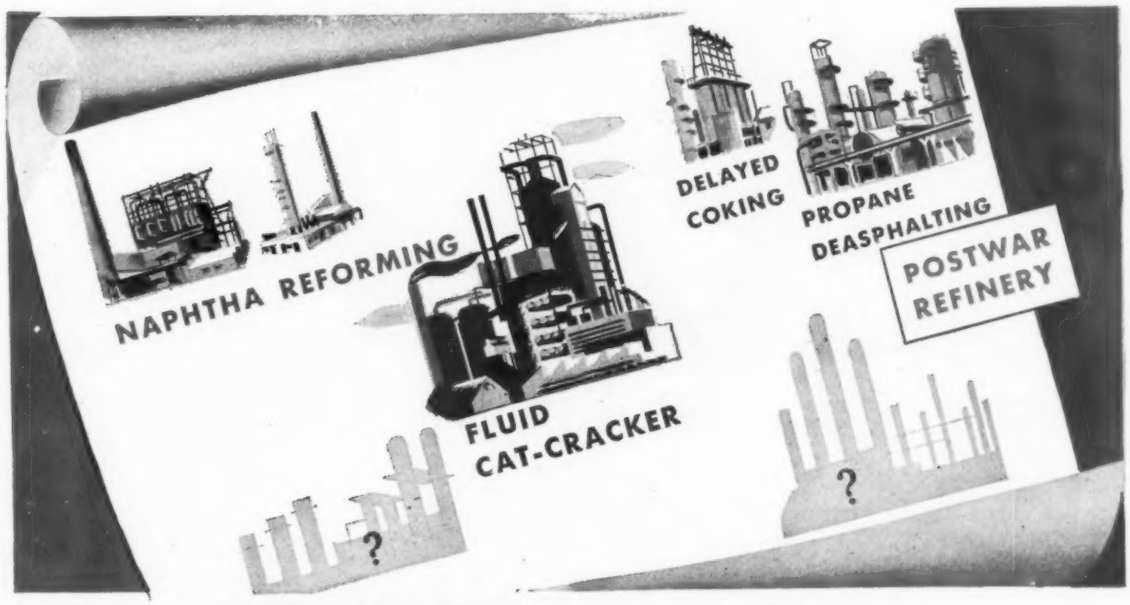
AMONG PETROLEUM marketing analysts the consensus is that postwar, house-brand gasolines will have at least an 80-octane (CFR-M) rating, while premium products will, of course, have even higher ratings.

With this trend in the making, refiners are now giving serious thought to postwar projects involving the stepping up of low grade naphthas. Three methods suit most requirements. (1) reversion, i.e., thermal reforming in combination with thermal polymerization. (2) thermal reforming with or without catalytic polymerization. (3) catalytic reforming or hydroforming.* The relative desirability of these methods is dependent, obviously, upon the octane level required, basic feeds, and cracking and reforming equipment currently available.

One of the surest ways for refining managements to safeguard capital investments and reach the *profitable* decision regarding choice of these alternate methods of reforming is to undertake a thorough economic analysis of overall operations. For years, M. W. Kellogg has emphasized this economic approach to engineering design and installations.

If naphtha remodernization is on your calendar . . . Kellogg engineers will be glad to help you put your project on the profits side of the ledger.

*Kellogg has designed and built *over 90 per cent* of the country's entire hydroforming capacity.



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Engineers and Economists to the Petroleum Refining Industry

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Petroleum in Peace and War

(*Continued from page 59*)

war era, it will do well to advance with its eyes open to this, the most fundamental of all business facts—that people are the purchasers of the products in which business deals.

Petroleum companies which have operated in China, for example, have realized this basic fact and have encouraged the inhabitants to make use of oil. That is the principle which should control all industry in the days that are to come. Business must concentrate on building up demand if it hopes to prosper.

The expansion of the use of any commodity cannot be efficiently attained by any system which encourages or permits restrictive practices. It is a basic error to attempt, as business and even governments frequently do, to eliminate competition by arrangements and agreements with respect to price, division of territory, and similar monopoly methods.

One of the instrumentalities of the charter of the United Nations, drawn at San Francisco, is the Social and Economic Council. Its task will be the economic rehabilitation of the whole world, by which we must mean the elevation of the standard of living of all people everywhere.

The petroleum industry, which in a very real sense is a world industry, as well as one in which American citizens play a most important role, has a rare opportunity to demonstrate how an enlightened world business can be improved by conscious and intelligent effort to justify the American principle of free and independent enterprise, the deadly enemies of which are monopolistic cartel agreements upon the one hand and state monopoly upon the other.

INSULATION
Specialists
Call STEVENS
4-3072 Tulsa

Illustrated are three views of recent STEVENS Insulation installation on the air condition unit for the National Bank of Tulsa building.

33 YEARS EXPERIENCE
In Insulating, Gaskets and Packing Material go into every STEVENS job.

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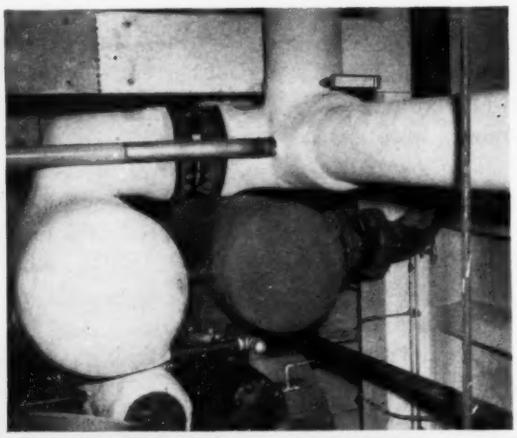
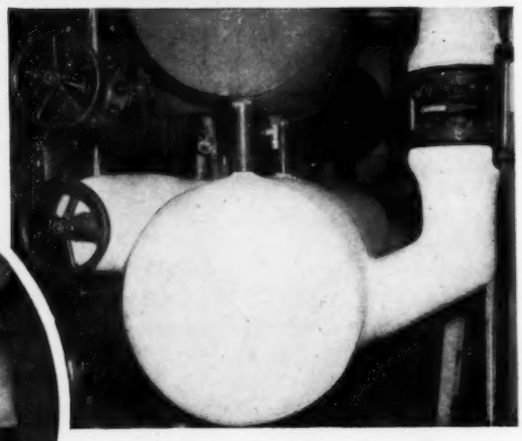
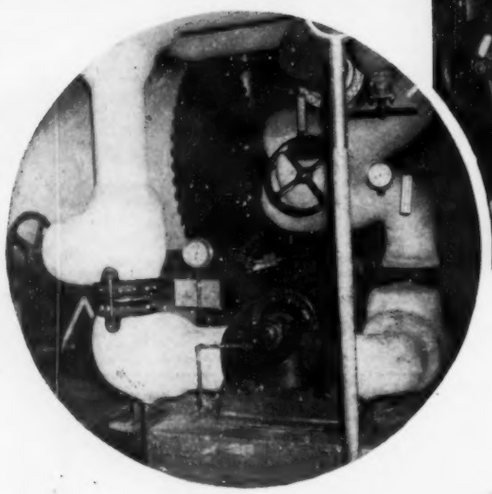
Factory Representatives with complete stocks of insulating materials.







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Gasket
for *EVERY Job!*

STEVENS Ring Type Cylinder Head Gaskets. Guaranteed not to blow-out or burn-out under pressure. The best cylinder head gasket made for any gas engine your money can buy—not a critical material.

Gaskets of Copper, Aluminum or other metals.

All types of Rubber Gaskets.

We can build any size or type gasket — you furnish the drawing or template.

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GASKET MANUFACTURERS INSULATING MATERIALS AND CONTRACTORS
322-4-6 East First St. *Call 4-3072* Tulsa, Oklahoma

One Man Portable Gravity Meter

A gravity meter which can be carried by one man instead of the usual three or four is a development announced by North American Geophysical Company. A pack is furnished to which the meter is fastened and carried comfortably on a man's back. The meter, weighing only 28 pounds, is temperature compensated, and the current required for maintaining the temperature is sufficiently low so that a single motorcycle battery will keep it unaffected by outside temperatures throughout the day. The weight of the entire unit, meter, back pack, and battery, is only 45 pounds. This light weight and easy portability makes it extremely versatile.

Deepest Well Under Test

TESTING operations are in progress on Phillips Petroleum Company's newest "world's deepest" well, the Schoeps No. 3 in the E. M. Millican Survey, Brazos County, Texas. In an effort to penetrate Cretaceous Age formations never before tested in the Gulf Coast Basin, Phillips drilled the well to a total depth of 16,655 feet with only one and a half day fishing job. At this point a 57 day fishing problem set in before the 5½" casing could be set, on May 20, in the Eagleford Section at 12,060 feet. The record depth was reached in a total of 354 elapsed days from moving in. Of these 315 were operating days; 15½ days were lost to repair shut downs, nine pilot reamers, 27 drag bits and 133 rock bits were utilized in the operation.

Aside from its depth, the Schoeps No. 3 set another record in penetrating 3,687 feet of salt overhang with attendant mud complications. Salt was encountered between 5656′ and 9343′ and the section was cased off at 3531′ with 9-5/8". Fifty-seven wire line and conventional cores as well as numerous side wall cores have been taken. The company is operating its own mud field laboratory equipment and figures recently released indicate that the well has used a total of 3,122 tons of mud in addition to 253 tons of chemicals.